



584

CONFIDENTIAL
FILE

PINE PASS COAL PROJECT

NORTHEAST BRITISH COLUMBIA

(1974 - 1975)

VOLUME III

BOREHOLE DATA

GEOLOGICAL BRANCH
ASSESSMENT REPORT

00 584

Prepared for: Pan Ocean Oil Ltd.
Calgary, Alberta

by: Paul Dyson Consultants
Calgary, Alberta

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CONFIDENTIAL

APPENDIX 1

BOREHOLE LOGS

LITHOLOGIC DESCRIPTIONS

PINE PASS COAL PROJECT

Drill Hole No.	H-1
Company:	Pan Ocean Oil Ltd., Calgary, Alberta.
Area:	Willow, Creek, Pine Pass Area, British Columbia.
Driller:	E. Russel, Canadian Longyear Ltd.
Hole Diameter:	NQ 1-63/64
Core Diameter:	1-7/8 - Diamond Drilling
Drilling Period:	January 22, 1973 - January 31, 1973
Total Depth:	1,516 feet
Surface Elevation:	3,695 feet (approximately - unsurveyed)

(feet)

0 - 24.0

Till.

24.0 - 159.0

Shale, black, marine-origin, massive,
some small-scale quartz veinlets, some
small-scale slump structure, bedding
plane - 20° dipping.

75.0 - fine grained, grey sandstone
(4" thick).

159.0 - 166.0

Shale, black, silty, channel-filling,
structure, some thin, dark grey siltstone
beds.

166.0 - 167.0

Siltstone, grey, some random directed,
small-scale quartz veinlets.

167.0 - 187.2

Shale, jet-black, massive.

187.2 - 191.7 (4.5')

Conglomerate, basal.

Pebbles - max. diameter - 1/2 inches,
dark grey and black chert
pebbles.

Matrix - silty, mudstone.

MOOSEBAR FORMATION - Marine

GETHING FORMATION - Non-marine

191.7 - 210.0

Shale, black, silty, massive.

210.0 - 241.0

Shale, black, silty, carbonaceous,
some thin small-scale quartz veinlets.
Bedding plane - approx. 25° dipping.

241.0 - 243.0

Siltstone, coarse grained, grey, sandy.

243.0 - 295.0

Shale, black, some quartz veinlets.
262 - grey, silty, carbonaceous shale
layers (2" - 5" thick).

295.0 - 310.5

Shale, black, carbonaceous, some fragments
of plant fossils.

310.5 - 313.5

Sandstone, fine grained, grey, shaly.
Bedding plane - approx. 20° dipping.

313.5 - 315.0	Shale, black, silty, some fragments of plant fossils.
315.0 - 328.0	Siltstone, dark grey, carbonaceous, sandy, cross-bedded.
328.0 - 331.0	Shale, black, carbonaceous.
331.0 - 341.6 (10.6')	Coal. Some thin shaly layers. 0.3' (337.6 - 337.9) - siltstone, blackish 0.7' (338.4 - 339.1) - shale, black, silty, carbonaceous.
341.6 - 345.0	Shale, black, coaly.
345.0 - 358.0	Shale, black, carbonaceous. 347' - thin carbonaceous, siltstone layers, some small-scale quartz veinlets.
358.0 - 360.0	Coal, shaly.
360.0 - 360.4	Siltstone, shaly, blackish.
360.4 - 364.6 (4.2')	Coal.
364.6 - 368.0	Shale, black, coaly.
368.0 - 370.3	Sandstone, fine grained, grey, some small scale quartz veinlets.
370.3 - 456.0	Shale, black, carbonaceous. 378 - coaly zone (0.5') 406 - coaly zone (0.5')
456.0 - 457.0	Siltstone, muddy, dark grey, cross bedded.
457.0 - 494.0	Shale, black, carbonaceous, some fragments of plant fossils.
494.0 - 495.0 (1.0')	Coal, clean.
495.0 - 508.5	Shale, black, carbonaceous, fossiliferous (plant).
508.5 - 512.6 (4.1')	Coal, clean.
512.6 - 618.5	Shale, black, carbonaceous. 520 - 0.5' coaly zone. 533 - 0.3' coaly zone. 596 - 0.4' coaly zone.

618.5 - 626.0	Sandstone, fine grained, grey, silty. Bedding plane approx. 27° dipping.
626.0 - 654.5	Shale, black, carbonaceous. 628 - 0.2' coaly zone. 637.2 - 0.2' coal, clean. 647.0 - 0.5' siltstone.
654.5 - 656.0 (1.5')	<u>Coal</u> , shaly.
656.0 - 662.0	Shale, black, carbonaceous.
662.0 - 669.0	Shale, black, silty.
669.0 - 671.5	Coaly shale.
671.5 - 721.2	Shale, black, carbonaceous
721.2 - 724.0	Siltstone, dark grey, muddy, many small scale quartz veinlets.
724.0 - 730.0	Shale, black, silty.
730.0 - 751.0	Siltstone, blackish, shaly. cross-bedded, some small scale quartz veinlets.
751.0 - 763.0 (0.5')	<u>Coal</u> , clean.
763.0 - 802.0	Shale, black, carbonaceous, some thin (2" - 3") coaly zones.
802.0 - 808.0	Shale, black, silty, 806.0 - 1.0' siltstone zone.
808.0 - 808.4 (0.4')	<u>Coal</u> .
808.4 - 810.0	Shale, black, carbonaceous.
810.0 - 813.5 (3.5')	<u>Coal</u> , thin shaly layers.
813.5 - 855.5	Shale, black, carbonaceous, some thin silty layers. 829.5 - coal (0.5')
855.5 - 858.0 (2.5')	<u>Coal</u> , shaly zones.
858.0 - 877.5	Shale, black, carbonaceous, some thin coaly layers.
877.5 - 879.5	Shale, coaly.

879.5 - 885.0	Shale, black, carbonaceous.
885.0 - 886.0 (1.0')	<u>Coal</u> .
886.0 - 914.0	Shale, black, carbonaceous.
914.0 - 919.0	Siltstone, carbonaceous, blackish, cross bedded.
919.0 - 930.0.	Shale, black, carbonaceous.
930.0 - 949.0	Siltstone, shaly, blackish, cross bedded.
949.0 - 970.0	Shale, black, carbonaceous. 950.6 - coal 0.2'.
970.0 - 974.6	Siltstone, sandy, dark grey, some small scale, chevron folds.
974.6 - 1043.5	Shale, black, carbonaceous, massive, some thin siltstone layers (2" - 3").
1043.5 - 1049.0 (5.5')	Coal, two thin shale layers (0.1' + 0.1') clean.
1049.0 - 1105.0	Shale, black, silty, carbonaceous. 1083 - siltstone (3') 1094 - siltstone (1')
1105.0 - 1106.0 (1.0')	<u>Coal</u> , shaly.
1106.0 - 1110.0	Shale, black, carbonaceous.
1110.0 - 1111.5 (1.5')	<u>Coal</u> , shaly
1111.5 - 1117.0	Siltstone, blackish, sandy.
1117.0 - 1143.0	Shale, black, carbonaceous. 1126.5 - 0.5' coal 1130.0 - 0.5' coal 1135.0 - 0.6' coal
1143.0 - 1154.7	Siltstone, dark-grey.
1154.7 - 1160.0	Shale, black, carbonaceous.
1160.0 - 1232.0	Siltstone, shaly, blackish, cross-bedded, hard, small-scale quartz veinlets, some shale layers (0.5' - 1.0').

1232.0 - 1247.0	Shale, black, carbonaceous. 1241' - 0.3' coaly zone. 1245' - 0.5' coal.
1247.0 - 1277.0	Siltstone, shaly, dark-grey, cross-bedded.
1277.0 - 1286.5	Shale, black, carbonaceous, some thin coaly zones (0.1' - 0.2').
1286.5 - 1304.0	Siltstone, sandy, dark-grey, very hard, cross-bedded, some thin, fine-grained grey sandstone layers.
1304.0 - 1334.0	Shale, black, silty, carbonaceous.
1334.0 - 1344.0	Siltstone, blackish, shaly, cross-bedded.
1344.0 - 1349.2	Shale, jet black, carbonaceous.
1349.2 - 1351.0	Sandstone, fine grained, grey.
1351.0 - 1364.0	Shale, black, carbonaceous, some thin siltstone layers.
1364.0 - 1386.0	Siltstone, dark grey, cross-bedded, some thin, fine-grained layers.
1386.0 - 1495.0	Shale, black, carbonaceous, some thin siltstone and sandstone layers (0.2' - 0.5').
1495.0 - 1499.0	Coaly shale.
1499.0 - 1508.0	Sandstone, fine-grained, dark grey, silty.
1508.0 - 1510.0	Shale, black, carbonaceous.
1510.0 - 1511.5	Coaly shale.
1511.5 - 1516.0	Shale, black, carbonaceous.

Total Depth - 1516.0 feet

PINE PASS COAL PROJECT

Drill Hole No.: H-2

Company: Pan Ocean Oil Ltd.,
Calgary, Alberta.

Area: Willow Creek, Pine Pass Area,
British Columbia.

Driller: E. Russel,
Canadian Longyear Ltd.

Hole Diameter: NQ 1-63/64

Core Diameter: 1-7/8 - Diamond Drilling

Drilling Period: February 1, 1973 - February 5, 1973.

Total Depth: 600 feet

Surface Elevation: 4,035 feet (approximately - unsurveyed)

(feet)

0 - 30.0	Till.
30.0 - 204.5	Shale, black, massive, marine - origin. 94.0 - 1.0' siltstone, grey.
204.5 - 205.7 (1.2')	Conglomerate, basal.

MOOSEBAR FORMATION

GETHING FORMATION

205.7 - 241.0	Shale, black, carbonaceous.
241.0 - 243.4 (2.4')	<u>Coal</u> , shaly.
243.4 - 329.0	Shale, black, carbonaceous. 251 - 2.0' silty zone. 270 - 2.4' silty zone. 273 - 0.4' coaly zone. 292 - 1.0' with small scale, quartz veinlets. 308 - 1.2' with quartz veinlets. 313.2 - 0.5' with quartz veinlets.
329.0 - 331.0	Siltstone, dark grey, shaly.
331.0 - 355.2	Shale, black, carbonaceous. 347.0 - 0.9' coaly zone.
355.2 - 360.5	Siltstone, dark grey, sandy, possible bedding plane - 17° dipping.
360.5 - 377.2	Shale, black, carbonaceous, some fragments of plant fossils. 362.0 - 1.8' silty zone. 374.0 - 1.0' siltstone, cross-bedded.
377.2 - 381.0 (3.8')	<u>Coal</u> .
381.0 - 385.0	Coaly, shale with thin siltstone layers (0.1' + 0.1')
385.0 - 391.0 (6.0')	<u>Coal</u> , clean.
391.0 - 396.5	Shale, black, carbonaceous.
396.5 - 398.0 (1.5')	<u>Coal</u> , shaly.

398.0 - 418.0	Shale, black, carbonaceous, 400.0 - with quartz veinlets (0.6')
418.0 - 448.0	Siltstone, blackish or dark grey, shaly. 433.0 - 2.0' with quartz veinlets.
448.0 - 506.0	Shale, black, carbonaceous, some plant fossils. 460.0 - 0.5' coaly zone. 464.8 - 0.5' conglomeratic, sedimentary- origin pebbles. 475.2 - 0.1' with quartz veinlets. 491.5 - 0.4' coaly zone.
506.0 - 511.0	Siltstone, dark grey, cross-bedded.
511.0 - 516.5	Shale, black, carbonaceous.
516.5 - 517.0 (0.5')	<u>Coal</u> , shaly.
517.0 - 527.5	Sandstone, fine grained, silty, dark grey, some quartz veinlets. 555.0 - (0.2') and 557.0 (0.4') - conglomeratic zones, angular black shale pebble.
527.5 - 529.0	Shale, black, silty, carbonaceous.
529.0 - 530.2	Sandstone, fine grained, dark grey, conglomeratic, angular shale pebbles. 0.5" - 2.0" thick quartz veinlets.
530.2 - 537.0	Shale, black, carbonaceous, thin sandy layers.
537.0 - 561.0	Siltstone, dark grey, some thin sandy layers.
561.0 - 588.0	Shale, black, carbonaceous. 563.0 - 1.0' with quartz veinlets. 570.0 - coal layers, poor recovery - 10%?
588.0 - 590.0	Coaly shale.
590.0 - 590.6	Shale, black, carbonaceous.

590.6 - 591.0

Coaly shale.

591.0 - 600.0

Shale, black, some coaly layers.

Total Depth - 600 feet.

PINE PASS COAL PROJECT

Drill Hole No.: H-3

Company: Pan Ocean Oil Ltd.,
Calgary, Alberta.

Area: Willow Creek, Pine Pass Area,
British Columbia.

Driller: E. Russel,
Canadian Longyear Ltd.

Hole Diameter: NQ 1-63/64

Core Diameter: 1-7/8 - Diamond Drilling

Drilling Period: February 5, 1973 - February 8, 1973

Total Depth: 700 feet

Surface Elevation: 4,035 feet (approximately - unsurveyed)

(feet)

H-3

0 - 20.0	Till.
20.0 - 52.2	Shale, black, massive, marine - origin.
52.2 - 53.2 (1.0')	Conglomerate, basal.

MOOSEBAR FORMATION

GETHING FORMATION

53.2 - 75.0	Shale, black, carbonaceous, some plant-fossil fragments. 66.0 - 0.1' coaly zone.
75.0 - 80.0	Siltstone, blackish, cross-bedded, shaly.
80.0 - 82.2	Shale, black, carbonaceous.
82.2 - 85.7 (3.5')	<u>Coal</u> , clean
85.7 - 101.0	Shale, black, carbonaceous. 91.0 - 1.0' siltstone, blackish. 96.0 - 0.5' siltstone, dark grey.
101.0 - 105.0	Siltstone, blackish, shaly, some small-scale, quartz veinlets.
105.0 - 116.0	Shale, black, some small-scale, quartz veinlets.
116.0 - 125.0 (9.0')	Poor recovery. Clay, dark grey, with some pebbles. Fault!

GETHING FORMATION

MOOSEBAR FORMATION

125.0 - 503.0	Shale, black, massive, marine origin, some quartz veinlets.
503.0 - 504.5 (1.5')	Conglomerate, basal.

MOOSEBAR FORMATION

GETHING FORMATION

504.5 - 504.8 (0.3')	<u>Coal</u> , shaly.
504.8 - 519.0	Shale, black, carbonaceous, some fragments of plant fossils.
519.0 - 521.0 (2.0')	<u>Coal</u> , shaly.
521.0 - 532.0	Shale, black, carbonaceous. 529.0 - 1.0' siltstone, dark grey.
532.0 - 536.0 (4.0')	<u>Coal</u> , shaly layers (0.1' + 0.1')
536.0 - 582.5	Shale, black, carbonaceous. 555.0 - 1.5' siltstone, sandy, dark grey.
582.5 - 586.0 (3.6')	<u>Coal</u> , clean.
586.0 - 591.6	Shale, black, carbonaceous.
591.6 - 602.0	Sandstone, fine grained, dark grey, shaly, some small scale, quartz veinlets.
602.0 - 623.8	Shale, black, carbonaceous, some thin coaly layers.
623.8 - 625.8 (2.0')	<u>Coal</u> , shaly layers.
625.8 - 626.7	Shale, black, carbonaceous.
626.7 - 635.0 (8.3')	<u>Coal</u> , clean. 632.2 - 0.8' coaly shale and siltstone.
635.0 - 639.0	Shale, black, carbonaceous
639.0 - 640.5 (1.5')	<u>Coal</u> , shaly.
640.5 - 641.0 (0.5')	Coaly shale.
641.0 - 644.5 (3.5')	<u>Coal</u> .
644.5 - 647.0	Shale, black, carbonaceous.
647.0 - 650.0	Siltstone, blackish, carbonaceous, sandy, some quartz veinlets.
650.0 - 700.0	Shale, black, carbonaceous. 652.2 - 1.0' coaly zone. 676.0 - 2.0' coal, shaly.

Total Depth - 700 feet.

PINE PASS COAL PROJECT

Drill Hole No.: H-4

Company: Pan Ocean Oil Ltd.,
Calgary, Alberta.

Area: Willow Creek, Pine Pass Area,
British Columbia.

Driller: E. Russel,
Canadian Longyear Ltd.

Hole Diameter: NQ 1-63/64

Core Diameter: 1-7/8 - Diamond Drilling

Drilling Period: February 10, 1973 - February 12, 1973

Total Depth: 303 Feet

Surface Elevation: 3,988 feet (approximately - unsurveyed)

(feet)

- 0 - 118. Shale, black and massive. Occasional streaks of very fine to fine sandstone (1" - 2").
- 118 - 118.5 Conglomerate containing rounded pebbles to 1/2".

MOOSEBAR FORMATION

GETHING FORMATION

- 118.5 - 127.4 Shale, dark grey to black, silty in part.
- 127.4 - 128 Coal.
- 128 - 140 Shale as 118.5 - 127.4.
- 140 - 144.8 Coal. (Recovery approximately 2.5').
Coal appears bright and low ash. It is possible that not all missing core is coal.
- 144.8 - 170 Siltstone and silty shale, medium to dark grey to black. Silt content increases with depth.
- 170 - 173 Sandstone, medium/light grey, fine/medium grained with occasional carbonaceous partings.
- 173 - 192 Sandstone, siltstone and shale. Generally dark grey to black, sandstone - very fine grained. Shales tends to be silty. Some horizontal fracturing filled with calcite.
- 192 - 198 Coal - clean, bright coal. Recovery approximately 5.2'. No partings. Roof appears to be massive siltstone.
- 198 - 263 Shale, dark grey to black and carbonaceous. Becomes silty in places. Contains thin (up to 1") beds of medium grey, very fine sandstone.
- 263 - 266.2 Coal.
- 266.2 - 267.8 Sandstone, medium/light grey, very fine grained.

267.8 - 284	Interval of very poor recovery. Predominantly shale/siltstone with some <u>coal</u> at base.
284 - 284.6	Sandstone, medium/light grey, very fine grained, - numerous thin laminae of silty shale.
284.6 - 285.6	Shale, black, very carbonaceous and fissile.
285.6 - 292	Siltstone, medium/dark grey to black, occasionally shaly and occasionally tending to very fine grained sandstone.
292 - 298	Sandstone, medium grey, very fine grained, cross-bedded with numerous small sedimentary structures.
298 - 303	Shale, medium/dark grey to black, tends to siltstone.
Total Depth - 303 feet.	

PINE PASS COAL PROJECT

Drill Hole No.: H-5

Company: Pan Ocean Oil Ltd.,
Calgary, Alberta.

Area: Willow Creek, Pine Pass Area,
British Columbia.

Driller: E. Russel,
Canadian Longyear Ltd.

Hole Diameter: NQ 1-63/64

Core Diameter: 1-7/8 - Diamond Drilling

Drilling Period: February 13, 1973 - February 14, 1973

Total Depth: 202

Surface Elevation: 3,965 feet (approximately - unsurveyed)

(feet)

0 - 33.6	Shale, black and massive.
33.6 - 34	Conglomerate containing rounded pebbles to 1/4".

MOOSEBAR FORMATION

GETHING FORMATION

34 - 45	Sandstone, medium/light grey, very fine grained interbedded with medium/dark grey siltstone in beds varying from laminae to 1/2". Bedding generally dipping approximately 20° to horizontal.
45 - 50	Shale, black, carbonaceous and massive.
50 - 65	Siltstone, and very fine sandstone, light to medium grey (sandstone) to dark grey (siltstone). Bedding approximately 20° to horizontal.
65 - 75	Shale, black and carbonaceous. Very soft in places.
75 - 93.5	As 50 - 65.
93.5 - 102.3	Sandstone, light/medium grey, very fine/medium grained. Tends to be fractured both along bedding and at right angles to bedding. Calcite filling of fractures.
102.3 - 121.5	Shale, medium/dark grey to black. Silty in part. Coaly streak (3") at 119'.
121.5 - 123.5	Sandstone, medium grey, very fine/fine grained - dip 50° to horizontal.
123.5 - 147.6	Siltstone and shales as above.
147.6 - 152	Shale, black, very carbonaceous, and blocky.
152 - 153.5 (?)	<u>Coal</u> - recovery only about 3" - 4".

153.5 - 168.7

Recovery very poor - some coal.

168.7 - 202

Shale and siltstone as above.

Total Depth - 202 feet

DH 75 - 2

- 0 - 22 Overburden.
- 22 - 48 Shales: Medium grey; locally silty and laminated; abundantly burrowed; strongly calcareous; BCA 85⁰; Moolabar shales.
- 48 - 75 Mudstone/Sandstone: interbedding of the lithologies; sharp and erosional contacts; sands clean; fine grained and laminated making up 25% of total.
- 75 - 140.5 Mudstone: dark grey; very uniform; little or no coarser fractures; erosional below.
- 140.5 - 160.5 Sandstone/Mudstone: preponderance of sands over muds; sharp mutual contacts; clean fine grained light grey sands; burrowed; gradational.
- 160.5 - 221 Mudstones; sequence begins with 1.5' of interbedded sands and shales grading into muds; sandstones constitute about 5% of sequence and often occur as 1" bands. BCA 85⁰.
- 221 - 238 Sandstones: light grey, fine grained; initial half 95% sands, rest about 70% sand and 30% muds.
- 238 - 248 Mudstones: medium grey; about 10% sands, gradational.
- 248 - 258 Sandstones/Mudstones: 70/30% (dominance of sands).
- 258 - 263 Mudstones: (95%) rest sands, dispersed.
- 263 - 287 Mudstones: medium grey; homogenously silty; initial 0.6' fine well laminated sands; muds lacking lamination. BCA 87⁰.
- 287 - 288 Sandstone: fine grained/ few ½" thick shaly bands; very gradational.
- 288 - 293 Mudstones: medium grey; vaguely banded; latter half richly silty sandy.
- 293 - 294.5 Sands: light grey; fine grained; well laminated (closely spaced).
- 294.5 - 298 Sandstones/Mudstone: broad interbedding; dominance of muds in lower half.

- 298 - 302 Mudstones: dark grey; homogenously silty; very few thin sand layers.
- 302 - 304 Sandstone: light grey; clean; well-sorted, fine grained.
- 304 - 315 Sandstone: light grey, fine-grained, making up 85% of sequence, rest muds.
- 315 - 325 Mudstones: subordinate amounts of silts and sands, very gradational below.
- 325 - 335 Sandstones: light grey; fine grained making up 8% of succession, rest silts and mudstones. BCA 80° at 334.
- 335 - 344 Mudstone/Sandstone: slight dominance of muds, some gradations into silts.
- 344 - 345 Sandstone: light grey; fine grained; erosional.
- 345 - 363 Sandstones/Mudstone: sands 60%, muds 40%.
- 363 - 382 Mudstone: dark grey; only 3% sands as small lenses; pyritic; gradational.
- 382 - 386 Siltstones: medium grey; very argillaceous; few streaks of shales as intraclasts; bioturbated; gradational.
- 386 - 398 Sandstones: medium grey; very fine grained; argillaceous; well laminated; some disturbed lamination; several shaly lenses up to 2" thick.
- 398 - 406.5 Mudstones: medium grey; distinctive sequence predominated by shales (90%); extensively burrowed and biogenically obliterated lamination.
- 406.5 - 411 Sandstones: medium grey; fine grained; uniformly laminated throughout.
- 411 - 421.5 Sandstones/Mudstone: rapidly alternating bands; sands 85%; rest shales.
- 421.5 - 426 Mudstones: 95%, sands 5% dispersed as thin layers.
- 426 - 453 Mudstones: dark grey; homogenous; bottommost 7.5' highly bioturbated with extensive vertical and horizontal burrows; only two lenses of sands, each up to 1". Interval almost exclusively of muds; gradational.

- 453 - 484 Sandstones/Mudstones: 70% sands, 30% muds; broadly alternating; BCA 80° at 478.
- 484 - 525.5 Mudstones: 85% mudstone interlayered with sands. Significant sandy intervals at 493 - 493.3; 493.5 - 494; 505 - 505.7 and 507.8 - 508.2.
- 525.5 - 527 Sandstones: light grey; fine grained; upper few inches with shale stringers and intraclasts; followed by 0.6' homogenous sands lacking lamination, rest well laminated sands with one 3/4" thick shale clast; bottommost 0.5' partially homogenized by organic activity; erosional below. BCA 85°.
- 527 - 528.7 Mudstone: medium grey; slightly sandy in the middle; gradational.
- 528.7 - 530 Sandstone: light grey; very fine grained; erosional lower contact.
- 530 - 827 Mudstones: dark grey; very homogenous and uniform looking; almost entirely devoid of current lamination and coarser terrigenous detritus. Occasional layers contain small scale tubular burrows. Pyrite as specks and blobs. One 0.8' buff grey and brownish band at 780 - 780.5; strongly calcareous. 3" light grey, very fine grained sandstone at 804. Top of this unit highly erosional, bottom though abrupt but not scoured. Whole of sequence otherwise monotonously developed. It is extremely difficult to discern bedding.
- 827 - 837 Mudstone: This unit represents an arbitrarily cut-off interval merely to emphasize its being affected by tectonic forces, otherwise lithologically it is similar to the preceding sequence. Much polishing and slickensiding is evident with numerous intertwining of calcitic veins.
- Fault -
- 837 - 848.5 Sandstones: light grey; fine grained; highly crushed and brecciated zones; abundant polished and slickensided surfaces. Shaly intercalations have served as lubricant zones along which movement has taken place (resulting into variously curved and polished surfaces). Interval 95% sand and seems to represent some higher level of Moosebar formation; abrupt lower contact; highly variable BCA throughout.

- 848.5 - 858 Mudstone: dark grey; crushed and polished;
some silts and fine sands.
- 858 - 863 Sandstone: light/medium grey; fine grained;
crushed.
- 863 - 870 Mudstone: medium grey; locally broken but not
crushed.
- 870 - 883 Sandstones: fine grained; well laminated;
BCA variably between 5 - 10°.
- 883 - 904 Mudstone: initial 7' has abundant argillaceous
very fine grained sandstone; muds medium grey;
locally broken up; variable BCA. At 901 - 902
thick calcite veins recementing broken fragments.
- 904 - 916 Sandstones: medium grey/very fine grained;
abundantly laminated; much burrowing;
pyrite blobs; some 5 - 7% shale
intercalations, strongly calcareous sands;
local fracturing and recementing calcite.
BCA 30° at 904 and 10° at 915.5.
- 916 - 948 Sand/Shales: dominantly fine sands interlayered
with muds; locally fractured and much calcite
veining.
- 948 - 958 Mudstone: medium grey; little or no silt.
- 958 - 968 Sands: fine grained; BCA 10°.

T. D.

- 0 - 5 Sandstone: fine to medium grained; grey; core broken throughout; irregular laminations; sporadic cross-bedding; dominantly quartzitic with supporting cherts and other dark materials; limonitic specks; in lower 2' a 6" interval of light grey sandstone coarser grained than surrounding rock with irregular silt intercalations; non calcareous; gradational; lower contact; BCA 70°.
- 5 - 14.5 Sandstone: medium to coarse; grey; core broken throughout and shaly zones shattered; shale intraclasts coal stringers; top 5' finer intervals; dominantly lithic with quartz secondary; non calcareous; abrupt lower contact (?); rusty weathering in fractures.
- 14.5 - 14.9 Coal: durain; appears to be misplaced in core box; check gamma ray-neutron logs.
- 14.9 - 18 Sandstone: coarse to gritty and in places cross bedded; grey; non calcareous; coal stringers; contact (lower) apparently abrupt.
- 18 - 23.5 Coal: upper half clarodurain; lower half durain; BCA 80°; recovery 75% (4' of 5.5').
- 23.5 - 28.5 Mudstone: initial 1.0' dark grey; coal stringers; carbonaceous; remainder medium grey; silty; non calcareous; gradational below.
- 28.5 - 30.5 Mudstone: medium grey; sporadic silt zones in upper half; calcareous.
- 30.5 - 38 Siltstone: medium grey; faintly laminated (sporadically); occasional (lower 5') zones of cross-bedded fine sandstone (small scale cross-beds); structurally intact; calcareous; scour and fill structures in lower 2'; erosional contact below.
- 38 - 46 Sandstone: fine to medium grained; medium grey; series of gradational intervals from fine to medium, silt and shale lenticular intraclasts varying from 1/8" to 1 1/2" in length and maximum of 1/4" in width; very calcareous; limonite weathering along fissures; gradational below; BCA 75°.

- 46 - 49 Sandstone: fine grained; well laminated; slightly argillaceous; dark grey; calcareous; small scale lamination.
- 49 - 65 Sandstone: medium grey; medium to coarse grained; ubiquitous cross-bedding; stringers of coal; intraclasts of dark silts; strongly calcareous; quartzitic; erosional contact.
- 65 - 86 Mudstone: silty; dark grey; non calcareous; silt is both homogenous as well as differentiated into laminations; coal stringer (1") in upper 1'; gradational contact.
- 86 - 87.5 Coal: clarodurain; bottom 2" is bone coal.
- 87.5 - 88.5 Mudstone: carbonaceous; coal stringers;
- 88.5 - 97.5 Mudstone: slightly silty; in places slickensided; medium grey; non-laminated; non calcareous; gradational below.
- 97.5 - 102.5 Mudstone: initial (top) 3' carbonaceous; dark grey; remainder non calcareous; medium grey; structureless; gradational contact below.
- 102.5 - 103.5 Siltstone: light grey; non calcareous; non laminated; gradational below.
- 103.5 - 112 Mudstone: dark grey; lower half sporadically carbonaceous; non laminated; slightly silty; calcareous; gradational below.
- 112 - 113 Siltstone: light grey; slightly argillaceous; carbonaceous particles; non calcareous; gradational below.
- 113 - 115 Mudstone: light grey; homogenous; gradational below.
- 115 - 119 Sandstone (fine) and Siltstone: light grey; calcareous.
- 119 - 124 Sandstone: light grey; very fine grained; 1' siltstone in centre of unit; cross-bedded and laminated; strongly calcareous; gradational below.
- 124 - 133 Mudstone/Siltstone: slightly laminated; siltstone to mudstone; medium grey; strongly calcareous; gradational below.

- 133 - 138 Sandstone: medium grey; fine grained; laminated; profusely cross bedded; calcareous; gradational below.
- 138 - 140 Mudstone: silty; dark grey; calcareous; fine laminations; carbonaceous intercalations.
- 140 - 160 Sandstone: medium grey; very fine to fine grained; profusely cross bedded and laminated; strongly calcareous; scour and fill structures; gradational below; BCA 80°.
- 160 - 176 Mudstone: medium grey to black; very carbonaceous and coal stringers in several horizons; 6" carbonaceous sandstone cross-bedded in first 5'; calcareous except for carbonaceous zones; gradational below.
- 176 - 187.7 Sandstone: medium grey; fine grained; banded appearance; small scale cross bedded; coal stringers in lower part; 183 - 184.5 is mudstone-siltstone; strongly calcareous throughout; abrupt contact below.
- 187.7 - 188 Coal - bone coal.
- 188.8 - 190.5 Mudstone: dark grey; homogenous; gradational below.
- 190.5 - 192 Coal: durain; gradational below.
- 192 - 197 Mudstone: dark grey; homogenous; silty in centre; gradational below.
- 197 - 202 Coal: 0.7' thick - vitrain - broken
0.4' thick - durain
0.8' thick - carbonaceous mudstone
1.3' thick - duravitrain
Recovery : 64% (3.2' of 5')
- 202 - 214 Siltstone and fine sandstone: medium to dark grey; siltstone dominates top half; sandstone dominates lower half; few silty mudstones in top half; several calcite stringers parallel to bedding; few coal stringers; calcareous; gradational below. BCA 85°.

- 214 - 216.5 Sandstone: light grey; very fine to fine grained; argillaceous banding; calcareous; gradational.
- 216.5 - 236 Mudstone: medium grey; locally silty; structureless; calcareous; gradational below.
- 236 - 254.5 Sandstone and Mudstone: interbedded; light grey; very fine sandstone; calcareous; small scale laminations; silty mudstone at base.
- 254.5 - 267.3 Coal: Recovery - 70% (254.5 to 258) (2.5' of 3.5') .8' durain; 1.7' clarodurain. Lost core 258.0 to 262.0.
Recovery 20% (262.0 to 267.0); .5' mudstone, .5' clarodurain and durain.
Recovery 100% (267 - 267.3) .3' durain.
- 267.3 - 333 Mudstone: dark grey; laminations destroyed by biogenic activity and scouring; very disturbed laminations; calcareous; silty zones; brecciated zone at 283' (2" thick); angular shards of mudstone embedded in calcite matrix; very distinctive zone containing much evidence of bioturbation; also carbonaceous fragments coated with calcite (micro.); slight pinkish appearance; BCA 250; gradational below; slickensided surfaces at intervals of approximately 9" (average); .4' fine, argillaceous sandstone near bottom.
- 333 - 337 Mudstone: dark grey; core broken (1" to 3"); polished surfaces (slickensided); calcite veins.
- 337 - 339 Mudstone: grey-brown; mud seam at 337 to 337.6; broken and crumbled for 6"; abrupt below; moist; some-slickensided surfaces; (fault?).
- 339 - 365.5 Mudstone: medium to dark grey; silty especially bottom 10' and carbonaceous and coaly 355 to 358; BCA 65⁰; fractured and calcite infilled near 340'; mostly calcareous particularly where silty; gradational below.
- 365.5 - 373 Sandstones: fine grained, richly argillaceous; mud bands associated with coaly shales; vague laminations; calcareous in sandier sections; non calcareous in muddier sections; gradational below; BCA 65⁰;

- 373 - 385.5 Sandstone: very fine grained and some silt layers; medium grey; richly argillaceous; irregular lamination; calcareous; gradational below.
- 385.5 - 398 Siltstones and Mudstones: dark grey; argillaceous; sparsely laminated; minor fractures infilled with calcite; coal intercalations to bedding; calcareous; evidence of bioturbation; sandy unit (387.7 to 388.2); fine grained; gradational below.
- 398 - 421.5 Sandstone: medium/light grey; locally fine grained; mostly fine grained; argillaceous; abundantly laminated and cross-laminated; sporadic calcite infillings of hairline fractures; some disturbed lamination and occasional burrows; ripple lamination; BCA 55°; strongly calcareous; transitional below.
- 421.5 - 425.5 Sandstone: light/medium grey; fine grained; argillaceous; abundantly laminated and cross laminated; strongly calcareous; bioturbations and occasional burrows; gradational below.
- 425.5 - 433 Siltstone with muddy intervals intermixed; sporadic laminated intervals; lower half dominantly muddy, strongly calcareous; gradational.
- 433 - 438 Mudstone: medium grey to dark grey; silty; sparse vague lamination; few coaly streaks; strongly calcareous.
- 438 - 452 Mudstone: dark grey to black; richly carbonaceous and isolated coaly layers; vertical fractures in interval 450 - 450.6; gradational below.
- 452 - 453 Sandstone: dark grey; abundantly argillaceous (up to 25%); vaguely laminated; richly calcareous; gradational.
- 453 - 454.5 Coal: dominantly bony with some carbonaceous sandstone.
- 454.5 - 467.5 Mudstone: dark grey to black; richly carbonaceous; few isolated coaly layers; slickensided at 466; highly argillaceous very fine grained sands at 458.5 - 459.2. Note that only 6.5' core recovered between 456 - 466.

- 467.5 - 468.5 Coal: dominantly durain.
- 468.5 - 476 Mudstone: dark grey; almost lacking in silts; locally highly carbonaceous; lower 1.5' highly fractured and traversed by calcite veins; gradational.
- 476 - 477.8 Coal: bony dominantly; some hard durain; gradational.
- 477.8 - 481 Mudstone: medium grey; sparingly silty; lacking lamination; slickensided; gradational.
- 481 - 504 Sandstone: medium grey; fine to very fine grained; abundant interlamination of silts and argillaceous matter. Sequence characterized by small scale ($\frac{1}{2}$ " thick) cross laminated and locally wavy units frequently interleaved by silt and clay grade laminae. Lower 4' show preponderance of argillaceous content; strongly calcareous; transitional below. BCA 55° at 499.
- 504 - 511 Mudstone: medium grey; homogenously silty; some small scale cross lamination; abundantly calcareous; gradational.
- 511 - 512 Sandstone: medium grey; very fine grained; small gradational units - fine sand grading upward into silt and mud, laminated bands show some syndepositional disturbance, strongly calcareous, gradational lower contact.
- 512 - 536 Mudstone: dark grey to black; dominantly richly carbonaceous; several dirty coaly layers; only 60% recovery between 517 - 527 - some larger coaly layers might have been lost, core broken up but no much slickensiding, gradational, BCA 55°.
- 536 - 538 Coal: predominantly bony, very hard and muddy.
- 538 - 551.5 Mudstone: medium to dark grey; numerous slickensided surfaces, devoid of silts and lamination, locally coaly especially around 548, non calcareous, transitional, 50% recovery between 548 - 558.
- 551.5 - 558 Coal Seam: dominantly durain, only 1.8' recovered.
- 558 - 567 Mudstone: black, richly carbonaceous, initial 1.5' has coaly intervals, gradational, BCA 50°.

567 - 569.5	Sandstone: medium grey, fine grained, argillaceous, coaly lenses, laminated and cross laminated, abundant intertwining of calcitic veins, abrupt below.
569.5 - 570.5	Mudstone: black, highly carbonaceous, slickensided surfaces, gradational.
570.5 - 571.5	Coal: highly slickensided and polished fragments of dirty coal.
571.5 - 574.5	Mudstone (some coal interval seems to have been lost); carbonaceous, polished surfaces, transitional.
574.5 - 580	Mudstone: dark grey, vague sporadic lamination, locally very silty and approaching fine grained sandstone, slightly carbonaceous, BCA 60°.
580 - 581	Coal: mainly bony coal, some durain.
581 - 587	Mudstone: medium grey, homogeneous, gradational.
587 - 598	Mudstone: carbonaceous, initial few inches in coal; recovery 1.5' between 587 - 592 and 1.7' between 592 - 598.
598 - 602	Coal Seam: mostly badly broken up dirty coal, 0.7' recovered.
602 - 628	Mudstone: dark grey to black, locally very carbonaceous, 3 distinct bands - each about 0.8' thick, very fine grained and argillaceous and small scale irregular cross-lamination, the latter calcareous, several zones exhibiting calcite fractures but local. Between 602 - 604 recovery 0.7', bottom 0.8' very carbonaceous, transitional.
628 - 633.5	Carbonaceous mudstone and coal: only about 1.5' recovery. Very little coal recovered and badly fragmented - difficult to assess exact coal interval.
633.5 - 639	Mudstone: initial 2' dark grey, carbonaceous and slickensided, rest competent, richly silty and strongly calcareous, gradational. BCA 50°.
639 - 644	Siltstone/Mudstone: about equal proportion, broadly laminated, strongly calcareous.
644 - 646	Sandstone: medium grey, very fine grained, vague lamination; very argillaceous in last 0.8', strongly calcareous, gradational.

- 646 - 648 Mudstone: medium grey; initial 0.5' has coaly streaks, rest locally sandy, calcareous, very transitional.
- 648 - 715 Sandstone: medium grey; dominantly fine grained; locally argillaceous; some brief gradational zones from sands to silts; laminated and prominently cross laminated throughout; few discrete burrows, few shaly zones (up to 0.5') mainly confined to initial half of interval, 0.3' dirty coal band at 703. A vertical fracture (almost parallel to core axis) at 713 - 714. Many microlithological contacts strongly to mildly erosional, strongly calcareous, BCA 60°.
- 715 - 720 Mudstone: medium grey; slightly silty; 1' sandy unit; very fine grained prominently cross-laminated; richly calcareous, gradational.
- 720 - 733 Carbonaceous mudstone and coaly zone: Interval 720 - 724 broken up, many polished fragments, recovery about 1.8'. It is a mixture of carbonaceous muds and dirty coal. Rest of sequence black mudstone locally richly carbonaceous. Recovery: 724 - 726 only 1.5', 726 - 729 only 1.3'; gradational.
- 733 - 737.5 Siltstones: dark grey, highly intermingled with argillaceous matter (10-12%), locally 1/8" thick very fine sand layers, non calcareous, gradational.
- 737.5 - 738.6 Mudstones: black, very carbonaceous, highly polished surfaces.
- 738.6 - 741.5 Sandstone: dark grey, very fine grained, abundantly interlayered with argillaceous matter, wavy lamination, calcareous, gradational. BCA 50°.
- 742.5 - 744 Mudstone: black, highly slickensided and polished, carbonaceous, abrupt and broken contact. Faulted contact.

- 744 - 777.5 Sandstone: light/medium grey, medium to coarse grained, very siliceous, and bend; dominantly lithic and cherty, non calcareous, mostly cross laminated, locally very coarse grained intervals (some very granular), much local fracturing apparent. Interval 762 - 766 abundantly vuggy - seem to have been caused by fracturing and recementation. Between 752 - 755 fine grained sand fractured and recemented at high angles. BCA 30° rest of interval has about 60° BCA, abrupt contact.
- 777.5 - 784 Carbonaceous Mudstone: very broken up - only 1' fragmented core - a mixture of black carbonaceous muds and some coal.
- 784 - 798 Mudstone: medium grey, very silty (homogenously) structureless, carbonaceous and coaly at 789 - 789.5. Non calcareous throughout, getting progressively sandier bottomward.
- 798 - 804 Siltstone: medium grey, richly argillaceous, some very fine sands in middle, non calcareous, gradational. BCA 60°.
- 804 - 810 Mudstone/Sandstone: initial half medium grey, dominantly muddy zone with subordinate amounts of very fine sands, grading into dominantly sandy (lithology with abundant shales), well laminated, strongly calcareous throughout.
- 810 - 837 Mudstone: medium grey, at places vaguely banded; 811 - 819.5 regular silty/fine sandy interlayering slightly carbonaceous at 812, non calcareous 822 - 837, rest calcareous. Lower contact has distinctly fractured look and ensuing sequence i.e. below 837 level, is thought to be repeated above. BCA 65°. Siltstone 834 - 837 - thrust.
- 837 - 842 Siltstone: medium grey, uniform, argillaceous, non calcareous, fractured at base, slightly sandier bottomward.
- 842 - 847 Sandstone: light/medium grey; fine grained; abundantly argillaceous, cherty and siliceous, hard, vaguely discernible cross bedding, gradational.

- 847 - 851 Sandstone: medium grey, prominently cross laminated, fine/medium grained, numerous carbonaceous laminae bottomwards, grading below to coarser lithologies.
- 851 - 877 Sandstone: medium grey, extremely hard and siliceous, dominantly medium-grained, while siliceous veins along fracture planes, totally non calcareous. Distinctly cherty (98%), minor quartzes as white grains welded into chert "matrix". Many fracture planes exhibit carbonaceous polished surfaces (slippage along carbonaceous planes). Dark grey uniformly on fresh broken surfaces. No argillaceous contact in matrix of sands. BCA 50⁰.
- 877 - 897 Sandstone: medium grey, very coarse grained, essentially cherty and siliceous, closely welded together, entirely non calcareous, very similar to above except distinctly coarser, no argillaceous content.

T.D.

- 0 - 15 No core.
- 15- 36 Mudstone: medium grey, very silty - as laminae and then well laminated layers, silty content increasing bottomward (5-8%), locally slightly carbonaceous, strongly calcareous, gradational. BCA 85⁰.
- 36 - 37 Mudstone: black, very carbonaceous, gradational.
- 37 - 39.5 Mudstone: medium grey, very vaguely laminated, richly silty, abundant carbonized leaves (revealed on breaking), passage below sudden but not erosional, strongly calcareous. BCA 85⁰.
- 39.5 - 43 Sandstone: medium grey, upper half dominantly medium grained with gradational intervals (up to $\frac{1}{4}$ ") ranging from clay grade through finely grained sands, laminated but much primary lamination obliterated by intensive burrowing. Lower half has up to 25% argillaceous and silty admixture, $\frac{1}{2}$ " coal band at 42.7, non calcareous.
- 43 - 43.8 COAL - mostly clean .
- 43.8 - 45.8 Mudstone: dark grey to black, carbonaceous with several thin coaly layers, non calcareous, very gradational below.
- 45.8 - 47 Siltstone: medium grey, very argillaceous, upper 0.4' has abundant small scale cross lamination, $\frac{1}{2}$ " fine grained sandy stringers, lower portion shows some lamination (partially surviving from organic activity), strongly calcareous, imperceptible passage.
- 47 - 49.5 Mudstone: dark grey, lower half 80% silts and some very fine sands, laminated, upper portion with numerous calcitic hairline streaks (along bedding), calcareous, gradational. BCA 84⁰.
- 49.5 - 52 Sandstone: medium grey to brownish grey; initial 0.5' fine grained cross-laminated with coaly laminae at base, grading below to 0.6' of sequence of richly argillaceous silty grading below to medium grained sands (1.4' thick). This latter unit traversed by a vertical fracture - now partially weathered by water action. No movement involved; abrupt and slightly scooped contact, calcareous.

- 52 - 54.5 Mudstone: medium grey, homogenously silty, structreless, very calcareous, gradational. Vertical to near vertical fracture still continuing in this unit and locally weathered.
- 54.5 - 59.5 Sandstone: medium grey, fine grained, irregularly laminated, argillaceous laminae and very thin layers, fractured at 56 - 57.5 and thickly calcite encrusted, gradual increase of argillaceous matter, bottomward strongly calcareous.
- 5b.5 - 70 Mudstone: dark grey to black, initial 2' carbonaceous and has 1" of coal and 2" of sands. Rest richly silty mudstone, vaguely laminated, strongly calcareous, $\frac{1}{4}$ " coal stringers, gradational. BCA 80°.
- 70 - 70.5 Sandstone: brownish grey, very fine grained, substantially admixed with argillaceous matter, increasing fines bottomwards, calcareous.
- 70.5 - 82 Mudstone/Sandstone: medium grey, initial half dominantly muddy with 10-12% silts, rest dominantly fine grained sands, well laminated and cross laminated, local isolated burrows, strongly calcareous, abrupt below.
- 82 - 83 Sandstone: light grey, medium-grained, clean, well sorted, strongly calcareous, vaguely cross laminated, erosional below.
- 83 - 84 Sandstone: medium grey, very fine grained, very argillaceous, gradational.
- 84 - 87 Mudstone: medium grey, abundantly silty (local differentiation), poorly laminated (sparse), strongly calcareous, abrupt.
- 87 - 88.5 Sandstone: light grey to medium grey, fine grained, lower half well laminated, slightly argillaceous, strongly calcareous, BCA 80°.
- 88.5 - 91 Mudstone: medium grey, upper part sparingly silty (homogeneous) lower half containing up to 20% silts and very fine sands, strongly calcareous, gradational.

91 - 96.2 Sandstone: medium grey, fine to very fine grained, sparse wavy lamination, richly argillaceous, lower half up to 30-35% shale, feebly calcareous in shaly zones, otherwise strongly calcareous, abrupt below.

96.2 - 96.5 Sandstone: light grey, fine grained, brownish weathering on fractured surface, non calcareous, abrupt below.

96.5 - 98 Mudstone: medium grey, slightly carbonaceous, devoid of silts, gradational.

98 - 110 Coal Seam : total recovery 5'. Breakdown of intervals as follows:

<u>Footage</u>	<u>Recovery</u>	<u>Lithology</u>
98-100	0.5'	Highly broken up, upper half clarodurain, lower half durain.
100-103	1.0'	Hard coal, mostly durain, 2" hard coal band.
103-108	2.7'	Mostly mushy coal, 1' durain in middle.
108-110	1.3'	Friable shiny coal.

110 - 117 Mudstone: medium grey, initial 5' slightly carbonaceous totally lacking lamination, 0.2' richly carbonaceous and coaly zone at base, rest bottomward getting siltier, non calcareous.

117 - 118 Siltstone: medium grey, irregularly laminated, richly argillaceous, strongly calcareous, very gradational below, some fine sand intercalations in middle. BCA 82°.

118 - 128.5 Mudstone: medium grey, initial 2.5' sparingly silty, middle 4.5' regularly intercalated by ½" to 2" very fine grained ripple laminated sands, some gradation to silts, strongly calcareous very gradational.

- 128.5 - 129 Mudstone: black, very carbonaceous and coaly bands.
- 129 - 134 Mudstone: medium grey, richly silty, locally vaguely cross laminated, strongly calcareous, bottom 0.2' polished.
- 134 - 135 Siltstone: medium grey, richly argillaceous (30%), very calcareous, gradational.
- 135 - 142 Mudstone: grey to brownish grey, abundant silts (local intervals), vaguely cross laminated in silty zones, richly calcareous, gradational.
- 142 - 147 Siltstone: brownish grey, richly argillaceous, small scale current lamination, micro-erosional contacts, some micro-slumping, sporadic burrowing, one 2" - 3" vertical dark burrow, bottom 0.5' abundantly argillaceous (25-30%), gradational, strongly calcareous. BCA 85°.
- 174 - 153 Mudstone/Siltstone: shale/silts intimately associated, slight (overall) dominance of silts, obscure to absent lamination, bottom 1' slightly carbonaceous, strongly calcareous, transitional.
- 153 - 154.5 Siltstone: brownish grey, richly argillaceous, lamination totally obscure to non-existent, appears to be a paleosoil, rootlet bed, as evidenced by general mottling and the presence of particular carbonaceous matters, normal to bedding. At the top of the unit 1" of fine to medium grained sandstone rich in detrital carbonate grains. Both contacts are sharp and bottom one mildly indented. The whole unit is strongly calcareous and gradational.
- 154.5 - 162 Mudstone: medium to dark grey, massive, upper sequence strongly calcareous, lowermost foot and one half is non calcareous, gradational.
- 162 - 165 Sandstone/Siltstone: light to medium grey first foot; very fine grained, small scale ripple cross lamination, laminated shaly bands intervening with erosional contacts on the sandy lens. The remaining sequence is silty and richly argillaceous with 2" of very fine sands embodying carbonaceous laminae. BCA 85°. Strongly calcareous and gradational.

- 165 - 166.2 Mudstone: homogeneous, patchily calcareous and gradational.
- 166.2 - 169 Coal Seam: first foot is bony coal with some carbonaceous mudstone at the bottom. The rest is very hard, dirty coal with small durain intervals.
- 169 - 171 Sandstone: medium to light grey, fine to medium sands with numerous argillaceous silty bands, cross laminated, strongly calcareous, erosional.
- 171 - 174 Mudstone: mostly homogeneous, a few fine sandy stringers, silty, strongly calcareous or abrupt below.
- 174 - 175 Sandstone: light grey, fine grained, strongly cross bedded, 2" zone containing fine silty intraclasts, getting finer towards the bottom, strongly calcareous and erosional below.
- 175 - 189.5 Mudstone: medium grey, abundantly silty especially at 176 - 177 and 181 - 185, silty zones, poorly laminated; calcareous from 175 - 186; remaining sequence, i.e. 186 - 189.5 non calcareous and has carbonaceous admixture.
- 189.5 - 190.5 Siltstone: light medium siltstones, cross laminated with numerous burrows, abundantly argillaceous. BCA 650. Strongly calcareous, gradational.
- 190.5 - 197 Mudstone: bottom 1½' richly carbonaceous.
- 197 - 198 Coal with two 1" sandstone bands in the middle.
Note: about 5' interval in density log - much coal lost there.
- 198 - 204.5 Mudstone: medium to dark grey, brownish grey patches; lower ½' calcareous and locally carbonaceous.
- 204.5 - 212.5 Siltstone/Mudstone: (alternating bands), locally laminated and cross laminated, some slumping in the small scale lamination. BCA 800. light to medium grey, strongly calcareous.
- 212.5 - 215.5 Mudstone: medium grey, richly silty, highly calcareous, bottom ½' richly carbonaceous.

- 215.5 - 217 Sandstone: medium grey, wavy small scale cross laminations, medium to fine grained; richly argillaceous; abundant burrows; strongly calcareous; gradational below.
- 217 - 219 Mudstones: medium to dark grey; locally carbonaceous and calcareous, gradational below.
- 219 - 220.5 Sandstones: medium grey; very fine grained; highly argillaceous; small scale cross laminations; strongly calcareous. BCA 70°.
- 220.5 - 225 Mudstones: medium grey; homogenous; uniformly disseminated silts; highly calcareous; bottom 1½' has up to 20% silts; gradational below.
- 225 - 228 Sandstones: fine; light grey; prominently displaying cross lamination; few coaly fragments; strongly calcareous; transitional in lower units.
- 228 - 235 Mudstone/Siltstone: medium grey; first half dominantly muddy; remainder dominantly silty; irregularly laminated; 0.5' of very fine grained cross laminated sands; effusively calcareous.
- 235 - 237 Mudstones: brownish grey; coal shattered slightly weathered (water zone); a few carbonaceous stringers; locally calcareous; gradational below.
- 237 - 242 Sandstone: medium grey; fine grained; abundant argillaceous content as 2 - 4" bands; obscure to impoverished lamination; gradational below; calcareous; from 237 - 238 non-calcareous.
- 242 - 243.5 Siltstone: medium grey; very argillaceous, gradational.
- 243.5 - 262 Sandstone: initial 2' are very fine grained; brownish grey; cross laminated; calcareous; next 3' are fine-grained, widely cross laminated with some disturbed laminations; light to medium grey; (½" thick 3" deep transverse sandstone dike at 245.5); the following 8' are light grey, well washed, fine-grained with cross-laminations. From 256 - 258.5 generally medium sandstones, but some medium to coarse-grained sands. The rest of the sequence is fine to very fine grained; with silt and argillaceous layers; very calcareous and gradational. BCA 70°.

- 262 - 267 Sandstone: very fine-grained; argillaceous; strongly calcareous.
- 267 - 269.5 Mudstone: structureless with two 1' very fine-grained sandy layers; calcareous and gradational.
- 269.5 - 273 Sandstone: fine-grained; medium grey; abundant small-scale cross-lamination with some burrowing; locally argillaceous and silty; gradations below.
- 273 - 274.2 Mudstone: initially carbonaceous; gradational.
- 274.2 - 275 Sandstone: light grey to medium grey; central 0.3' fine-grained, the rest very fine-grained with argillaceous lamination; calcareous and gradational.
- 275 - 277.5 Mudstones: medium grey; abundant, disseminated silts; calcareous; gradational.
- 277.5 - 279 Sandstones: medium grey to light grey; very fine-grained; abundant small-scale cross-lamination; regular argillaceous layers and laminations throughout; erosional.
- 279 - 279.8 Sandstone: light grey; medium-grained; abundantly cherty; cross-laminated; some silty laminae; abrupt contacts; very calcareous.
- 279.8 - 282 Sandstone: initial 1' richly argillaceous siltstones with a large coal stringer along core axis. The remaining is fine-grained laminated and cross-laminated. Numerous silty bands with erosional contacts; some deformation of lamination; strongly calcareous and transitional below.
- 282 - 286.5 Siltstones: medium grey; argillaceous; up to 15% vague laminations; strongly calcareous; gradational.
- 286.5 - 292.8 Mudstones: medium grey; very homogenous; with a few local silty bands; strongly calcareous and gradational.
- 292.8 - 299 Mudstones: initial 1½' and the bottommost 1½' are very coaly and argillaceous. The remainder is slightly silty with occasional carbonaceous interpolations; patchily calcareous; gradational.

- 299 - 302 Coal Seam: Mostly clarain/durain, 66% recovery (over 6' on density log).
- 302 - 334 Mudstones: medium to dark; carbonaceous; (first foot carbonaceous, also 307.5 to 308.5 is carbonaceous, at 323 - 324 carbonaceous) structureless throughout; silty units locally, especially between 327 and 329.5 locally enriched with silts. Patchily calcareous, gradational below.
- 334 - 334.4 Sandstone: very fine-grained; cross-laminated; slightly argillaceous; calcareous.
- 334.4 - 340.5 Mudstones: medium to dark grey; calcareous; homogeneously silty; gradational below.
- 340.5 - 347 Siltstone: medium grey throughout; abundant argillaceous matter in homogenous form. Non-calcareous bottom foot 30% argillaceous matter; gradational below.
- 347 - 363 Mudstones: with medium grey colour; some silty intervals with homogeneous zones; generally structureless; initial 1½' has fine carbonaceous matter; non-calcareous between 355 to 360; rest strongly calcareous.
- 363 - 369 Sandstone/Siltstone: medium to brownish grey; 60% silt and 40% sand; some muddy intervals; sand layers at 366.3 - 367.2; strongly calcareous and gradational.
- 369 - 373.4 Mudstone: highly silty; homogeneously silty; strongly calcareous; gradational.
- 373.4 - 383 Mudstone: Coaly Zone: sequence is generally carbonaceous and locally grading into dirty coal with the significant layer being 378 - 383, but there is carbonaceous mudstone.
- 383 - 393 Mudstone/Siltstones: with a slight dominance of muds overall; structureless; non-calcareous.
- 393 - 403 Sandstone: light to medium grey, very fine grained; abundance of intercalated silty layers; sequence regularly cross-laminated on small-scale; a few burrows - one 4" deep, cylindrical, sand-filled burrow. BCA 80°.

- 403 - 406 Siltstones: medium grey; abundant argillaceous matter; sparsely laminated; strongly calcareous except lower foot.
- 406 - 409 Mudstones: medium to dark grey; structureless; non-calcareous; bottom 0.4' richly carbonaceous; highly argillaceous, very fine-grained sandstone.
- 409 - 412 Coal Seam: first 1.25' is clear coal, the remainder is bony coal and mudstones:
- 412 - 418 Sandstone: medium-grey; very fine-grained; very argillaceous and up to 15% argillaceous matter in middle 1.5'; sporadically laminated and cross-laminated. Bioturbation at 417, calcareous except initial 1.5'; gradational.
- 418 - 421 Mudstone: medium grey, silty increasing bottomwards; $\frac{1}{4}$ " thick silty layers; strongly calcareous, gradational.
- 421 - 425.5 Siltstone: brownish grey; abundantly argillaceous; few sandy bands (very fine-grained); sparse lamination; strongly calcareous; gradational. BCA 80°.
- 425.5 - 428 Carbonaceous Mudstone/Coal: initial .4' carbonaceous mud, rest dirty coal.
- 428 - 430.5 Mudstone: grey to rusty (slightly); structureless, calcareous, gradational.
- 403.5 - 432 Sandstone: originally deposited as alternating sands and silts, subsequently reworked by organisms, hence chaotic lamination and odd intermixing of the lithologies, strongly calcareous, gradational.
- 432 - 437 Sandstone: grey, fine-grained, abundant argillaceous and silty layers, some closely spaced lamination, local burrowing, lower $\frac{1}{2}$ ' richly admixed with argillaceous matter, strongly calcareous. BCA 82°.
- 437 - 440 Siltstone/Mudstone: initial half dominantly silty, rest dominantly muddy, generally structureless, strongly calcareous, gradational.

- 440 - 441 Sandstone: light/medium grey, lower 0.3' fine-grained, rest very fine-grained (locally approaching silty grade), good small-scale cross laminated units, several discrete burrows and some bioturbation, strongly calcareous, abrupt.
- 441 - 444.5 Mudstone: brownish grey, generally structureless, few silty stringers bottomwards, strongly calcareous, mottled contact.
- 444.5 - 445.5 Sandstone: light grey, fine-grained, strongly cross-laminated, some banded silts, erosional, strongly calcareous.
- 445.5 - 446.5 Siltstone: medium grey, richly argillaceous, mottled lamination, calcareous.
- 446.5 - 447 Sandstone: very fine grained, silty/muddy bands, strongly calcareous.
- 447 - 449 Mudstone: medium grey, slightly carbonaceous lower end, strongly calcareous (except lower half), gradational.
- 449 - 451 Sandstone: medium grey, very fine-grained, argillaceous, chaotic fabrics, erosional, strongly calcareous.
- 451 - 467.5 Mudstone: medium grey to dark grey, lacking sedimentary structures, locally silty especially at 459 - 462; very fine sands at 455.5 - 457, argillaceous, wavy lamination with numerous "rootlet" type structures (non calcareous sands), bottom 1.5' very carbonaceous muds, gradational, mostly calcareous.
- 467.5 - 470 Coal Seam: (estimated thickness) about 1' fractured clarodurain recovered.
- 470 - 472 Siltstone: dark grey, highly argillaceous and embodying fine carbonaceous matter, chaotic lamination, patchily calcareous, transitional.

- 471 - 473.5 Sandstone: medium/light grey; very fine-grained; initial half very argillaceous, cross laminated, very calcareous, gradational.
- 473.5 - 479 Mudstone: uniformly grey, abundance of silts - as layers and laminaes (up to 15%), strong calcareous. BCA 55° at 478.5.
- 479 - 481.5 Sandstone: light grey, upper 2/3 very fine-grained and argillaceous, lower 1/3 fine grained and cleaner, strongly calcareous, gradational.
- 481.5 - 488 Mudstone: medium to dark grey, locally very silty and slightly carbonaceous, bottom 1.5' has 0.5' dirty coal, gradational.
- 488 - 510 Sandstone: light/medium grey, dominantly fine-grained, some intervals grading to very fine sands and silts, generally well cross-laminated (small scale) and some intervals with exquisite rippling. Significant muddy/silty band - 494.5 - 497 and 504 - 506. Many isolated burrows and local bioturbation, fractured and healed interval: 501 - 503. Strongly calcareous, very gradational. BCA 75°.
- 510 - 517 Siltstone: medium grey, gradual increase of argillaceous content bottomward, fracture vertical and recemented by calcite, very calcareous.
- 517 - 529 Carbonaceous Mudstone and Coal Zone: richly carbonaceous mud. Bony coal: 519.5 - 520 and 524 - 527, gradational.
- 529 - 546 Mudstone: medium to dark grey, abundantly silty (homogeneous) and some isolated silty zones, much carbonaceous matter (revealed in breaking), characteristic calcite impregnation of plant matter (coating), strongly calcareous except 537 - 541, very gradational below.
- 546 - 553 Siltstone: grey, very argillaceous, bottom 3' has up to 30% shales; very fine sand with collapsed lamination at 547 - 548, strongly calcareous, transitional.

- 553 - 554 Sandstone: light grey, closely spaced cross-laminated units, abundant hairline calcite (along laminae), fine-grained, strongly calcareous. BCA 45°.
- 554 - 565.5 Siltstones: medium grey, very argillaceous and locally developing into shales, abundant "whorling" and many large and small burrows, locally some lamination; some sands (very fine grained) notably at 560 - 561.5, slightly fractured; strong calcareous, gradational.
- 565.5 - 568.5 Sandstone: light grey, fine-grained, intensively laminated and cross-laminated, abundantly burrowed (approaching bioturbation), locally very fine grained, strongly calcareous, erosional.
- 568.5 - 570 Mudstone/Siltstone: sequence extensively homogenized - presumably by organisms, burrows discernible, whorling, strongly calcareous, erosional.
- 570 - 572 Sandstone: light/medium grey, fine grained, laminated and cross laminated, burrowing, silty bands, strongly calcareous, erosional.
- 572 - 573.5 Siltstone: highly argillaceous (20%), erosional.
- 573.5 - 578 Sandstone: grey, very fine grained, muds about 1.2', some burrowing, very argillaceous throughout, strongly calcareous.
- 578 - 579 Mudstone: brownish grey, riddled with calcitic hairlines, strongly calcareous.
- 579 - 582.5 Sandstone: medium grey, very fine grained, very argillaceous, broadly laminated; bottom 1' with good cross lamination but locally badly obliterated by intensive burrowing, strongly calcareous, gradational. BCA 50°.
- 582.5 - 583 Mudstone: hard, very carbonaceous.
- 583 - 585 Mudstone: medium grey, abundantly silty, vague lamination, strongly calcareous, gradational below.
- 585 - 590 Siltstone: medium grey, abundant very fine sands as laminae and layers, strongly calcareous, transitional.

- 590 - 595.5 Sandstone: light grey, dominantly fine grained, silty unit at 591 - 592. Sands characterized by ubiquitous ripple drift cross lamination, slight fracturing interval; strongly calcareous, transitional.
- 595.5 - 598 Siltstone: medium grey, very argillaceous, 0.2' well cross laminated fine sand, bottom 1.5' seemingly whorled and has calcitic hairlines, strongly calcareous, erosional.
- 598 - 600 Sands: light/medium grey, very fine grained, some shaly intraclasts in upper 0.5', well cross laminated, strongly calcareous, gradational below.
- 600 - 608 Mudstone: medium grey, abundance of silts, silty layers and laminae, strongly calcareous.
- 608 - 614.5 Sandstone/Siltstone: dominance of very fine sands, frequently laminated and cross laminated, many burrows; argillaceous silts, strongly calcareous throughout; two 1" thick calcite veins, gradational.
- 614.5 - 628.5 Mudstone: medium grey to dark grey, one coaly lens mainly structureless, slightly calcareous initial 1.5', rest non calcareous, gradational.
- 628.5 - 631 Siltstone: medium grey, very argillaceous, vaguely discernible, sparse lamination, moderate to feeble calcareous content. BCA 40°.
- 631 - 632.7 Coaly/carbonaceous mudstone.
- 632.7 - 638 Mudstone: medium/dark grey, totally non calcareous, polished fragmented core at 636 - 637. No significant movement, slightly silty, very gradational, carbonaceous.
- 638 - 642 Mudstone/Sandstone: medium grey, initial 1.5' very silty, non calcareous, mud grading below to very fine sands, argillaceous and cross laminated. Bottom 0.3' highly silty muds, calcareous, gradational.
- 642 - 646.5 Sandstone: light grey, dominantly fine grained, has regular small scale cross-laminated units, regular silty/muddy laminae, some slumping and burrowing, bottom 1.25' with abundant argillaceous content, strongly calcareous, gradational.

- 646.5 - 662 Sandstones: medium grey/dark grey, fine to very fine grained, abundant small scale cross lamination; some intervals grading to silts/muds, local bioturbation, many calcite veins, few thin muddy zones - slightly carbonaceous, strongly calcareous, transitional. BCA 75⁰. Repetition of facies on a scale (average of 6").
- 662 - 666 Mudstone: medium/dark grey, locally carbonaceous, silty and 0.3' sandy layers in middle, partially calcareous, gradational.
- 666 - 668.5 Sandstone: medium/dark grey, very similar to 646.5 - 662 interval, erosional below.
- 668.5 - 671 Mudstone: medium grey, richly silty, non laminated, strongly calcareous, erosional.
- 671 - 674 Sandstone: light grey, fine grained, upper 1' beautifully cross-laminated, 0.5' silty mudstone in middle, strongly calcareous, abrupt below.
- 674 - 683.5 Mudstone: medium grey, very silty, lower 5' have irregular silty banding at places; 0.3' siltstone bands, highly bioturbated at 682. 0.3' slightly carbonaceous band at 678.2', strongly calcareous, erosional lower contact.
- 683.5 - 686 Sandstone: light grey, fine grained, abundantly cross-laminated, some wavy lamination, 0.2' silty/muddy band, a large calcite filled fracture in initial 1'; bottom 0.3' has many discrete burrows, strongly calcareous, erosional.
- 686 - 688 Mudstone/siltstone: medium/dark grey, much burrowing, lower half laminated, numerous calcite veining, strongly calcareous, erosional below.
- 688 - 689.3 Sandstone: fine-grained, light grey, closely spaced cross-lamination, strongly calcareous, some dislocation of laminae due to fracturing, numerous calcite veins, very gradational.
- 689.3 - 700 Siltstone/Mudstone: initial half dominantly muddy and 20% silts - dispersed and layers, rest dominantly silty broadly laminated, strongly calcareous, erosional. BCA 60⁰.
- 700 - 705.5 Mudstone: dark grey/black, locally very carbonaceous and coaly.

- 705.5 - 707 Sandstone: dark grey, richly argillaceous, very fine grained, laminae poorly discernible, and locally bioturbated, non calcareous.
- 707 - 724 Sandstone: light/medium grey, fine to medium grained, locally grading to finer sands, ubiquitous fine coaly shards, small scale cross-lamination, bottom 3' highly silty/argillaceous and rapidly changing lithologies and extensively burrowed, strongly calcareous, very gradational. BCA 80°.
- 724 - 736.5 Mudstone/Siltstone: rapidly varying lithologies on a scale of incline, intergrading sequence of muds/silts occasionally developing into very fine sands, broad banded look, locally burrowed, overall dominance of muds, strongly calcareous. BCA 60°.
- 736.5 - 744 Mudstones; medium to dark grey, slightly silty, occasional vague lamination, middle 2' not calcareous, rest very calcareous.
- 744 - 745 Siltstone/Mudstone: medium grey, alternating sequence of, strongly calcareous.
- 745 - 747.6 Mudstone: medium grey, silty, slightly banded, calcareous, carbonaceous and coaly in bottom 0.5', gradational.
- 747.6 - 765 Siltstone/Mudstone: 70% muds, very broad bands grading into very fine sands and silts, local burrowing, bottom 7' more uniform, strongly calcareous. BCA 70°.
- 765 - 770 Mudstone: medium grey, locally silty, sporadic coaly streaks, calcareous, gradational.
- 770 - 772 Carbonaceous and coaly mudstone: less than 50% core recovery.
- 772 - 791 Mudstone: medium/dark grey, silty (uniformly dispersed), 1' fine sands, argillaceous at 773 - 774, carbonaceous at 779 - 780 and bottommost 1.5' with 0.2' muddy coal, some burrowing in lower 3.5', calcareous, gradational.

- 791 - 816.5 Sandstone: medium/dark grey, fine to very fine grained, rapidly varying lithologies, much small scale cross-lamination, much burrowing and one large vertical burrow (0.5') penetrating at a base a slumped layer; locally grading into silts and muddy sequences. Bottommost 3' richly muddy and silty (up to 30%), strongly calcareous, gradational. BCA 80°.
- 816.5 - 818.5 Mudstone: dark grey/black; initial 0.7' silty and laminated, rest carbonaceous and coaly.
- 818.5 - 819.5 Coal - mostly clarodurain, bottommost 0.3' carbonaceous mudstone.
- 819.5 - 848.2 Mudstone: medium/dark grey, 70% silty mudstone, carbonaceous at two levels; distinct very fine grained, locally bioturbated, very argillaceous, cross-laminated sands at 834 - 843. Muds with abundant hairline calcite encrustation along bedding (following carbonaceous matter), strongly calcareous.
- 848.2 - 851 Coal Seam: (estimated thickness); only few coal fragments (clarodurain) present.
- 851 - 877 Sandy/silty/muddy lithologies: medium grey, a very distinctive zone with rapidly changing (every inch or so) facies; from fine sands-silts to shales, abundantly cross-laminated (small scale) but many zones bioturbated and lamination obliterated, many slump laminations, bottom 8.5' dominantly muddy, strongly calcareous. BCA 80°.
- 877 - 879.5 Mudstone: initially some coal (0.3') and some 0.1' in middle, rest black carbonaceous mudstone, gradational.
- 879.5 - 897 Coal Seam: predominantly clarodurain, 3.5' recovery, 20%.
- 897 - 900 Mudstone: initial 1' very coaly/carbonaceous, rest slightly carbonaceous black mudstones.
- 900 - 907 Coal Seam: initial half dominantly vitrain, rest clarodurain, 0.2' durain at base. Recovery 3' : 43%. (Both the coal intervals sampled and bagged separately and intervening mudstone interval excluded and left in box.)

- 907 - 933.6 Sandstone: medium grey, dominantly very fine grained, rapidly variable lithologies, abundant silty/shaly zones, well cross laminated throughout, few burrows; interval 925 - 932 fine/medium grained sands and its upper half with abundant fine silty/shaly clasts, abundant carbonaceous matter and argillaceous in bottom 1.5', strongly calcareous, gradational. BCA 60°.
- 933.6 - 938.5 Coal Seam: clarodurain about 1.2' recovered, not sampled.
- 938.5 - 947 Mudstone: medium/dark grey, abundantly silty, vaguely laminated, abundant localization of calcitic hairlines along carbonaceous intercalations, strongly calcareous, gradational.
- 947 - 975.7 Mudstones/siltstones: medium grey to black, argillaceous, about 65 - 70% muds locally passing to silts and veryfine sands; sandy zones well cross-laminated, slight burrowing; whole sequence characterized by several thin coaly intercalations (less than 1" thick), strongly calcareous, abrupt below.
- 975.7 - 1020.3 Sandstone: light grey, dominantly medium-grained, mostly well washed and well sorted (within a given interval), coarse grained at 997 - 1008, abundant coaly shards at 947 - 1012. Initial 3' with small intraclasts. Initial 20' with well defined cross lamination, strongly calcareous, Dominantly cherty 80% or more, bottommost 1.5' abundantly argillaceous and medium grey, very abrupt contact.
- 1020.3 - 1029.2 Mudstone: dark grey/black, two rusty bands (iron enriched), about 3" each, siltier at base, non calcareous throughout. BCA 60°. Abrupt contact.
- 1029.2 - 1032.2 Sandstone: light/medium grey, fine to medium grained, small scale cross-lamination, 0.1' very fine dark sands in middle, strongly calcareous, gradational.

- 1032.2 - 1048.5 Sandstone: medium grey, generally fine grained, rapidly intergrading sequence of sands, silts and shales though overall sands remain dominant. Small scale cross-lamination, emphasized throughout by regular silty/shaly intercalations. Many isolated burrows and local partial bioturbation, strongly calcareous.
- 1048.5 - 1052 Sandstone: fine grained, medium grey, substantially less argillaceous and silty content than the above zone, much bioturbation, strongly calcareous, gradual below.
- 1052 - 1055 Sandstone/Mudstone: medium grey, initial half fine grained mottled sands richly argillaceous, grading below to dominantly muddy highly bioturbated zone simulating intraclastic lithology, lamination entirely obliterated, strongly calcareous, gradual below.
- 1055 - 1068 Mudstone: medium grey, slightly sandy and silty, 1' of very argillaceous fine sand, upper interval calcareous, lower 6' non calcareous. BCA 50°.
- 1068 - 1070 Mudstone/Siltstone: medium grey, about equal proportions, slightly bioturbated, calcareous, gradational.
- 1070 - 1074 Sandstone: medium grey, very fine grained, has regular small scale cross-lamination, frequent interlamination of silts and shales, calcareous.
- 1075 - 1087 Mudstones: dark grey to black, little or no silts, structureless, carbonaceous, in lower 3' non calcareous throughout.

T.D.

DH 75 - 5

- 0 - 16 No core.
- 16 - 17 Sandstones: fragmented, granular to gritty, siliceous.
- 17 - 18 Sandstones: brownish grey on weathered surface, very fine grained, argillaceous, strongly calcareous, appear gradational.
- 18 - 23 Sandstone: brownish grey, mostly fragmentary and weathered, highly argillaceous; frequently intercalated with silty and argillaceous laminae and layers, small scale cross lamination, strongly calcareous; gradually increasing argillaceous content.
- 23 - 32 Mudstones: medium grey, largely fragmented, little or no silts, bottom 2' dark grey and slightly carbonaceous and embodying hairline calcite along bedding, calcareous throughout. Two distinct 3" bands, rusty and heavier (Fe enriched).
- 32 - 33 Mudstone: black, shaly, carbonaceous, abrupt below.
- 33 - 37.5 Sandstone: light/medium grey, fine/medium grained, hard quartzose, 5% cherts, non calcareous, obscure cross lamination, locally shows some gradations (to silts and fine).
- 37.5 - 39.5 Conglomerate: pebbles 1/8" thick, middle 0.3' silty/shaly with granules.
- 39.5 - 41.7 Siltstone: medium grey, argillaceous, very vague discontinuous lamination, very argillaceous at base, abrupt, strongly calcareous.
- 41.7 - 50 Gritstone/fine pebble conglomerate: has sandy zones medium to coarse grained, poorly sorted, calcareous, over 75% cherts, rest quartzes, erosional below.
- 50 - 58 Mudstones: medium grey, structureless, abundantly silty, 0.4' very fine grained argillaceous bioturbated sandy zone, strongly calcareous, very gradational below. BCA 87⁰.

- 58 - 61.5 Sandstone/siltstone: intergrading sequence of, some argillaceous content, very small scale ripple cross lamination, strongly calcareous, gradational.
- 61.5 - 63 Mudstone: medium grey, very silty, vaguely laminated, calcareous, transitional.
- 63 - 64 Sandstone: brownish grey, vertical fracture and weathered (no structural dislocation), fine grained, strongly calcareous, gradational.
- 64 - 66.5 Mudstone: dark grey, lower half black, locally very carbonaceous, 2" coal, bottom 6' very silty, strongly calcareous, gradational.
- 66.5 - 68 Siltstone/mudstone: light/medium grey, very small scale cross lamination, argillaceous bands, very calcareous, gradational.
- 68 - 79 Mudstone: medium grey/dark grey, local rusty bands, calcareous except dark grey (possibly carbonaceous) bands.
- 79 - 81 Sandstone: medium grey, very fine grained, slump lamination; highly argillaceous (up to 10%), calcareous, gradational.
- 81 - 84 Mudstone: black, carbonaceous and coaly, 0.2' very silty in lower half, abrupt below, mainly non calcareous.
- 84 - 90.5 Sandstones: light grey, medium grained, 0.1' coarse sand at 88'; 0.3' very sandy mudstone (dark grey) at 88.7 with a highly indented contact at top; abrupt lower contact, calcareous.
- 90.5 - 96.3 Mudstone: black, richly carbonaceous, very gradational.
- 96.3 - 97.8 Coal: initial half dirty, rest clean coal.
- 97.8 - 105 Sandstone/mudstone: Broad (1' and over) alternations of very fine cross laminated sand with mudstones (carbonaceous slightly), calcareous, very gradational below.

- 105 - 123.5 Mudstone: medium grey to dark grey, structureless, non calcareous, carbonaceous at 112 - 113, 115 - 116, 117.7 - 118.5 and 123 - 123.5 - the latter gradational into coal zone.
- 123.5 - 128 Coal Seam: 50% recovery, not sampled, mostly durain.
- 128 - 130 Carbonaceous Mudstone: 50% recovery, some coal apparently lost. Much bony coal fragments present.
- 130 - 133.5 Mudstone: medium grey, very slightly carbonaceous, non calcareous, gradational.
- 133.5 - 135 Mudstone/sandstone: medium grey, initial half very silty, rest very fine grained, richly argillaceous, sandy with slumped lamination, strongly calcareous.
- 135 - 137.3 Mudstone: dark grey/black, initial half locally very carbonaceous, lower half very silty and calcareous, gradational.
- 137.3 - 145 Sandstone/Mudstone: medium grey, very fine grained, rapidly integrating sequence (changes -n scale of inches), silts and muds 30%, much slumped lamination, burrowing, a very large vertical burrow, irregular bioturbated, strongly calcareous, gradational.
- 145 - 151 Mudstone: medium to dark grey, initial 2' substantially silty, locally slightly carbonaceous, bottom 0.5' very coaly, strongly calcareous, BCA 85°.
- 151 - 189 Sandstone: light/medium grey, 80% sands - very fine grained intergrading into silts and muds. Characteristically laminated./cross laminated, much slurred and distorted lamination and burrowing - a distinctive slumped laminated unit, strongly calcareous; bottom 2.2' clean, fine grained sands, abrupt below.
- 189 - 199 Coal/Shale Zone: from 189 - 192.5 durain and bony coal, 0.3' mudstone, rest of sequence has bony coal and 1.5' shale in middle, bottom 1' very carbonaceous and with coaly layers. Difficult to ascertain exact coal intervals due to poor recovery (50%).

- 199 - 297 Mudstone: medium to dark grey; very silty especially lower, laminated, burrowed in silty zones, very calcareous, gradational below.
- 207 - 213 Siltstones: medium grey, regular intervals of very fine argillaceous sands; burrowed zones; micro-erosional contacts; very calcareous; gradational below.
- 213 - 239 Sandstones: light grey; dominantly medium grained; initial 5' very fine grained; collapse breccia (syndepositional); some fine intraclasts; well cross laminated; bottom 5' dark grey with fine carbonaceous matter (non calcareous); rest very calcareous, erosional below.
- 239 - 241.3 Gritstone and very coarse sandstone: ill-sorted, bottom half many clay clasts; erosional below..
- 241.3 - 258 Mudstones: medium to dark grey; 242 - 247 is very fine grained sands alternating with mudstones (calcareous), 253 - 255 black carbonaceous mudstone (non- calcareous); gradational below.
- 258 - 271 Mudstones: medium grey; silty 258 to 261; 268.5 to 271 muds; mudstones non-calcareous; silty mildly calcareous.
- 271 - 276 Sandstones: light-medium grey; regularly banded and laminated of muds and silts; sporadic burrows; micro-lithologies have erosional top; very calcareous; below is interbedded.
- 276 - 293 Mudstones: black; locally carbonaceous; coaly at 283 to 284.5 and 287.5 to 288; iron rich mudstone bank top foot; non calcareous; abrupt below.
- 293 - 298 Mudstone: very fine sandy and silty; rootlets; presumably paleosoil; non calcareous; gradational below.
- 298 - 308 Siltstone: medium grey, very argillaceous, two brief sandy zones, calcareous.
- 308 - 320 Sandstone: medium grey, very fine grained, irregularly laminated, slight mottling, initial 0.2' carbonaceous mudstone, followed by 1.7' of fine grained homogenously argillaceous sands with numerous rootlet like carbonaceous structures (non calcareous), some silty mudstone 316.5 - 318 and 318.3 - 319. Sequence generally calcareous; gradational.

- 320 - 322 Sandstone: light medium grey, fine grained, abundant small scale cross lamination, sporadic burrowing, slightly argillaceous, strongly calcareous; gradational.
- 322 - 325 Mudstone: medium grey, very silty, sporadic lamination; strongly calcareous.
- 325 - 329 Sandstone: light/medium grey, dominantly very fine grained, 0.5' fine sand in middle, several 2" - 3" muddy intercalations; 1" shaly intraclastic zone, generally strongly calcareous, erosional.
- 329 - 331.5 Mudstones: medium grey, silty, vague interrupted lamination, strongly calcareous, very gradational below.
- 331.5 - 333 Sandstone: medium grey, very fine grained and highly argillaceous, upper half with diffused lamination, lower half prominently laminated and partially burrowed, strongly calcareous; very gradational; BCA 78⁰.
- 333 - 334.5 Mudstone: medium grey; very uniform; strongly calcareous; abrupt.
- 334.5 - 336.5 Sandstone: light grey; fine grained; very calcareous; erosional.
- 336.5 - 372 Mudstone: Initial 24' medium grey and homogeneously silty, richly calcareous, rest black carbonaceous with local coaly stringers and non calcareous. Iron enriched mudstone (pyritized) at 359 - 359.4, gradational.
- 372 - 373 Coal: dirty coal, mainly durain.
- 373 - 390 Mudstone: dark grey to black, initial 2' and between 378 - 380 and in bottom 3' black and carbonaceous and non calcareous; rest silty. At 385 - 386.2 finely cross laminated fine sands with few burrows.
- 390 - 394 Siltstone: uniformly grey, structureless, non calcareous; gradational.
- 394 - 400.5 Sandstone/Mudstone: alternating but variable bands of very fine sands and muds, mutually erosional boundaries, burrowing within sandy layers - 55% muds, 0.1' coaly zone at base.

- 400.5 - 403.5 Sandstone: light grey, medium grained, very clean and well sorted, strongly calcareous, erosional below.
- 403.5 - 408.5 Mudstone: medium grey, richly silty strongly calcareous, vague distorted lamination, bottom 1.5' black and slightly carbonaceous, abrupt below.
- 408.5 - 415 Siltstone: light/medium grey, vague rootlet type structures, vague and sporadic lamination but generally structureless, non calcareous. Levee deposits?; abrupt but not erosional.
- 415 - 434.7 Sandstones: light/medium grey, fine to very fine grained, locally passing to silts and muds (constituting 25% of total), much obliterated intervals, locally fine coaly shards and intraclasts, some slumping and obscured lamination, strongly calcareous, gradational; BCA 80°.
- 434.7 - 436.5 Mudstone: medium grey to dark grey, sporadically calcareous, gradational.
- 436.5 - 441 Siltstone: grey, upper part devoid of lamination, rest with some small scale cross lamination, very argillaceous and sandy, strongly calcareous, gradational.
- 441 - 458.8 Mudstone: medium grey, locally very silty/sandy especially at 442 - 443 where it is abundantly burrowed. Also sandy at 449 - 451 and has small ripple lamination. Carbonaceous 454 - 455.5; mostly strongly calcareous, very gradational.
- 458.8 - 461 Siltstone: medium grey, richly argillaceous, middle 0.5' very sandy and argillaceous, obscured lamination, strongly calcareous.
- 461 - 464 Sandstone: medium grey, initial half 50% dark silts, rest light grey clean fine grained sands with small cross-lamination; strongly calcareous; gradational.
- 464 - 467.5 Mudstone: black, top 1' very silty and strongly calcareous, rest homogeneously carbonaceous and non calcareous; erosional.

- 467.5 - 473 Sandstone: light grey, medium grained, thin intervals of finer sands - whole sequence characterized by abundant small coaly wisps, poorly laminated, strongly calcareous, erosional; BCA 82⁰.
- 473 - 483 Mudstone/Siltstone/Sandstone: alternating sequence of slight overall dominance of muds, 25 - 30% sand in lower half, much burrowing, strongly calcareous, abrupt below.
- 483 - 489.5 Sandstone: medium grey, series of gradations of fine/medium sands abundant coaly shards, one .3' intraclastic zone, strongly calcareous, erosional.
- 489.5 - 496 Siltstone/Mudstone/Sandstone: medium grey, initial 2.5' very silty muds, followed by 2' of very fine highly argillaceous sands. Rest argillaceous silts with small sandy intercalations, some burrowing, strongly calcareous, very gradational below.
- 496 - 506 Sandstone? light/medium grey, fine grained, cross-laminated, occasional burrows, bottom 2.5' has 50% argillaceous content, strongly calcareous.
- 506 - 517.5 Mudstone: medium grey to black, carbonaceous and coaly at 508 - 509, rest also dark and slightly carbonaceous. Very silty/finely sandy at 512 - 516.5, strongly calcareous, gradational.
- 517.5 - 535.5 Mudstone/Sandstones: broad bands of the lithologies imperceptibly passing to each other, slight preponderance of muds, much slumping and extensive local burrowing; strongly calcareous; very gradational lower end.
- 535.5 - 544.5 Sandstone: medium grey, initial 2' very fine grained, finely cross-laminated, rest fine grained, local slumping burrowing and many argillaceous laminations. Bottom 3' has finely broken up coaly matter and sparse carbonaceous laminae. Strongly calcareous throughout; abrupt contact; BCA 85⁰.
- 544.5 - 548 Mudstone: black, carbonaceous, non calcareous; very gradational.

- 548 - 556 Siltstone: medium/dark grey, highly argillaceous, slumping, isolated burrows; some very fine sands, strongly calcareous; gradational.
- 556 - 560 Mudstone: medium grey, highly silty, initial 1.5' carbonaceous, bottom 1' vaguely banded, abrupt below; strongly calcareous.
- 560 - 565 Coal Zone: about 1' recovered - initially some highly pulverized coal, rest broken up durain. Difficult to ascertain actual coal thickness.
- 565 - 568 Mudstone: black, locally carbonaceous, non calcareous; gradational.
- 568 - 572 Coal Zone: about ½' broken up durain recovered.
- 572 - 578 Mudstone/Siltstone: initial half muds, rest argillaceous silts, ?coal.
- 578 - 579.5 Coal/Mudstone Zone: broken up, less than 1' recovered.
- 579.5 - 582 Siltstone: medium grey, argillaceous, 0.1' coaly/muddy zone lower end, non calcareous.
- 582 - 604.5 Sandstone: light/medium grey, dominantly medium grained, initial 5' fine grained, generally clean and well-sorted, calcareous, vaguely discernible cross bedding, coaly shards and stringers. Very abrupt lower contact. BCA 85°.
- 604.5 - 607 Mudstone: black, very carbonaceous with some bony coal, non calcareous, gradational.
- 607 - 612.2 Sandstone: light/medium grey, initial 1.5' very fine grained and argillaceous, gradational passing to fine grained sands, cross laminated, calcareous, erosional below. Contact with muds below, locally burrowed.
- 612.2 - 621.5 Mudstone: medium grey, silty, carbonaceous at top and in bottom 1', non calcareous throughout; very gradational.
- 621.5 - 629 Sandstone: medium grey, very fine grained and very argillaceous especially bottom 1.5', sporadic lamination, calcareous, transitional.

- 629 - 633.5 Sandstone: light grey, fine grained, some silty intercalations at top, cross-laminated, strongly calcareous, gradational.
- 633.5 - 636.5 Sandstone/Mudstone: medium-grey, upper half very fine argillaceous sand, lower zone silty mudstone, calcareous, gradational.
- 636.5 - 665.5 Sandstone: light/medium grey, fominantly medium grained, clean and well sorted, weakly calcareous, cross-bedded, a slumped cross-bedded unit at 643 - 644, two quartzite (white) pebbles, less than $\frac{1}{4}$ " long embedded in sands, short fine sand zones; normal sedimentary lower contact.
- 665.5 - 667 Conglomerate: commonly $\frac{3}{4}$ " pebbles of quartzite, cherts, siltstones, etc., middle very sandy and chunks of coal; erosional below. BCA 85°.
- 667 - 672.5 Sandstone: medium grey, very fine grained, argillaceous, slumping in bottom 1.5', very calcareous, gradational.
- 672.5 - 686 Siltstone/mudstone: dominance of silts, broad intergrading bands, some ripple lamination in upper 5'; fine sands at 672.5 - 673.5, abruptly high BCA 45° at 683.5 - a fractured and healed zone, strongly calcareous throughout, gradational.
- 686 - 691 Mudstone: black, locally coaly stringers abound, carbonaceous, a 0.3' rusty band, upper half strongly calcareous, rest non calcareous, gradational.
- 691 - 703 Siltstone/mudstone: medium grey, silts 80% rest muds at intervals, locally some ripple lamination, 0.2' fine sand stringers, carbonaceous at 698 - 698.5, calcareous; very gradational. BCA 82°.
- 703 - 711 Sandstone: medium grey, very fine grained, beautiful ripple cross-lamination in upper 2', very argillaceous, strongly calcareous, gradational.

- 711 - 737 Sandstone: light/medium grey, dominantly fine grained, very fine grained and richly argillaceous at 713 - 727 and this interval characterized by almost total obliteration of sedimentary lamination; rest of sands frequently intercalated with argillaceous layers, especially at 718 - 726.5. In the latter zone much bioturbation, slumping and characteristic micro-erosional contacts, Wispy shaly intraclasts: 726 - 728. Lower 10' well laminated and cross-laminated, between 732 - 733 coarse to very coarse grained sands, very cherty. Bottom 0.5' richly admixed with argillite, feeble to strongly calcareous, gradational.
- 737 - 745.5 Siltstone: medium grey, 80% silts, rest mud dispersed, central 2' has partially obliterated laminae, strongly calcareous.
- 745.5 - 749 Coal Zone: dominantly bony coal, mudstone around 747.5 - 748.5.
- 749 - 768.5 Siltstone: medium grey, very argillaceous, locally passing to very fine grained sands, occasional vague parallel and slightly wavy lamination strongly calcareous. BCA 85°.
- 768.5 - 770 Mudstone: medium grey, very silty, gradually passing to sands.
- 770 - 771.5 Sandstone: medium grey, very fine grained, abundant small scale cross-lamination, slightly argillaceous, strongly calcareous, abrupt.
- 771.5 - 781 Mudstone: medium/dark grey, slightly carbonaceous in middle 1' and in bottom 1.5', locally silty, entirely non calcareous save 0.1' silty band, very transitional.
- 781 - 782.5 Sandstone: medium grey, interbedding of very fine sands with silts and muds, well laminated throughout, strongly calcareous.
- 782.5 - 783.5 Mudstone: black, very carbonaceous, non calcareous.
- 783.5 - 788 Sandstone: medium grey, very fine grained, some distorted and slump lamination, middle 1' richly silty dark grey mudstone upper 1.5' very calcareous, rest non calcareous, gradational.

- 788.- 788.5 Mudstone: black, richly carbonaceous, gradational.
- 788.5 - 790 Mudstone: dark grey, very homogenous, non calcareous, gradational.
- 790 - 794 Sandstone: medium grey, very fine grained, regular argillaceous intercalations, locally well cross laminated, aberrant burrows, upper half non calcareous, rest calcareous. BCA 85°.
- 794 - 806.5 Siltstone: medium grey, locally muddy, very fine argillaceous sands at 798 - 799; carbonaceous 799.3 - 799.8, bottom 4' non calcareous, rest sporadically calcareous.
- 806.5 - 811 Sandstone: medium grey, upper 2.5' medium grained with 0.3' very fine sand in 808 - 808.3, lower zone very fine grained argillaceous sand, strongly calcareous, very transitional below.
- 811 - 813 Mudstone: medium grey, very silty, structureless, decreasing calcareous content bottomward, slightly gradational.
- 813 - 816 COAL - mostly durain, fragmented (less than 1' recovered).
- 816 - 826.5 Siltstone/mudstone: medium to dark grey, locally especially at 817 to 818.5 and 821.5 to 822.5; locally laminated; calcite fracture zone at 823.0; strongly calcareous; gradational below.
- 826.5 - 873 Sandstone: medium grey; fine to very fine grained; slight dominance of fine grained; ubiquitously argillaceous, cross laminated; sporadic burrows; coaly zones: 835.0 to 835.3 and 840.5 to 840.8; gradational below; sporadically calcareous 868 to 870, carbonaceous intercalations.
- 873 - 889 Mudstones/siltstones: light to dark grey; locally carbonaceous; small stringers of very fine sands with cross lamination and with much burrowing; strongly calcareous save bottom 2'; BCA 80°; gradational below.

- 889 - 982.5 Sandstone: light grey, initial 15' fine grained, remainder medium grained; clean sands; cross laminated; conglomeratic at 918 to 919; 933 to 934; siltstone at 936.5 to 937; mudstone at 924 to 925; few isolated quartzite pebbles; coaly lenses at 930 to 932; siliceous to calcareous (feebly) throughout, but upper 30' strongly calcareous; 70% quartz and 30% chert; BCA 80°; abrupt contact.
- 982.5 - 985.5 Mudstone: medium grey; silty; irregularly laminated; slight calcareous gradational below.
- 985.5 - 988.5 COAL - clarodurain and durain; bottom 1/2' friable.
- 988.5 - 1002 Mudstone: medium grey; silty; non calcareous to 997; bottom 5' calcareous, gradational below.
- 1002 - 1067 Sandstone: light grey; dominantly medium grained; brief fine grained intervals; clean sands; cross laminated; locally homogenous intervals; 1038 to 1042 medium to coarse grained and pebbly; 1042 to 1053 and 1062 to 1067 coarse sandstone; abundant coaly stringers; coal band 1½" at 1052.5; initial 5' silty intraclasts and layers; with erosional boundaries; slump lamination at 1013 to 1014.5; calcareous; BCA 78°; erosional below.
- 1067 - 1075 Mudstone: brownish to dark grey; vaguely banded with silty layers; strongly calcareous; gradational below.
- 1075 - 1078.5 Sandstone: light to medium grey; very fine grained; cross laminated; slumping; argillaceous layers; strongly calcareous; gradational below.
- 1078.5 - 1107 Mudstone: black, homogenous; upper 15' carbonaceous with coaly stringers; bottom 6' silty slickensided surfaces 1098 to 1103; but no major displacement involved.
- 1107 - 1138 Mudstone: dark grey; middle section silty and very fine sandy (especially 1119.5 to 1121); cross laminated; streaks of coal and carbonaceous mudstone in lower 5'; iron enriched band 1123 to 1124; sporadically calcareous especially where silty.

- 0 - 101 Overburden.
- 101 - 104 Sandstones; light/medium grey; fine to medium grained; core fresh but upper and lower portions broken up and shorn. BCA 40°. Lower half distinctly different sandstone. Interval 101 - 104 is thought to be a loose block and has no evidence of normal contact with the shales below.
- 104 - 294 Moosebar Formation: medium-grey, sometimes dark grey, uniformly muddy, locally calcareous and darker zones, non calcareous. Mostly devoid of lamination, brief intervals slightly rust grey and very strong calcareous. Highly silty and calcareous at 264 - 267. Bentonitic layers: 126.1 - 126.3, 149.3 - 149.5 and a small stringer 5 inches below it. The largest Bentonite band at 151 - 151.4. All the bands have well defined and erosional contacts with lithologies on either side. Distinctively rusty/grey and highly limy at 263 - 269. Interval 269 - 282 has regular but laterally sometimes discontinuous silty laminations and layers (maximum ¼" thick). Much small-scale burrowing discernible. BCA 75°. Lower contact abrupt but not erosional.
- 294 - 297 Conglomerate: sequence defining top of Gething formation dominantly in coarse gritstone, granulite grade - one pebble about 1" spherical; uppermost 1' has pea sized pebbles and is the coarsest interval, also calcite veined. In bottom foot, 1" carbonaceous and coaly muddy stringer. Bottom contact highly indented and some material presumably derived from base is incorporated in lower bottom sediments. Conglomerate locally strongly calcareous.
- 297 - 303 Mudstone: medium grey to brownish grey, very highly silty (15% homogenized silts), generally structureless, strongly calcareous, finely disseminated pyrite as irregular patches, 0.2' band in middle riddled with almost parallel calcite veining, gradational.

- 303 - 318.5 Mudstone: medium to dark grey; locally very carbonaceous; especially at 311 - 312; calcareous; gradational.
- 318.5 - 319 Mudstone/Coal: upper half carbonaceous mudstone; remainder coal.
- 319 - 324.5 Siltstone/Mudstone: medium grey to brownish grey; initial 2' has some very fine sands; laminated, strong calcareous throughout. BCA 80°.
- 324.5 - 329.5 Sandstone: medium grey; initial 2' very argillaceous - 10 - 15% as layers, rest generally clean; fine grained; cross laminated; a vertical fracture at 327; strongly calcareous; erosional below.
- 329.5 - 346.8 Mudstone: dark grey; very sandy at 337 - 339.5; calcareous.
- 346.8 - 350 Coal: about 0.8' recovered, fractured badly; mostly durain.
- 350 - 352 Mudstone: dark grey to black, very carbonaceous especially upper 1'; abrupt below.
- 352 - 354 Sandstone: medium grey; initial 0.8' very fine grained; rest fine grained; some argillaceous laminae in lower half; well laminated and cross laminated throughout; very calcareous; lower contact abrupt.
- 354 - 357 Mudstone: dark grey to black; very carbonaceous; slightly slickensided, otherwise structureless; non calcareous; gradational.
- 357 - 358.5 Mudstone: brownish grey, very silty; vaguely laminated; strongly calcareous; gradational. BCA 60°.
- 358.5 - 370 Carbonaceous Mudstone/Coaly Zone: mostly black; abundant polished surfaces; much coaly zones; especially at 362 - 370 but only 20% recovery in this interval; gradational.
- 370 - 372.5 Mudstone: black; slightly carbonaceous; coaly stringers; non calcareous.

- 372.5 - 377 Sandstone: medium grey; dominantly very fine grained and locally approaching silt grade; richly argillaceous (10%); locally well laminated; abrupt but not erosional lower contact.
- 377 - 396.7 Mudstone: dark grey, very thin silty zones; structureless; much polishing and slickensiding; patchily calcareous; fractured contact.
- 396.7 - 404 Mudstone: initial 3' heavy and rusty weathering (after exposure to atmosphere and rain for few days); rest medium to dark grey; vaguely laminated; lower half locally carbonaceous; rusty zone strongly calcareous; rest patchily. Brecciated at 396.7 - 397, erosional below.
- 404 - 405 Sandstone: medium grey; very fine grained; some discontinuous carbonaceous laminae, strongly calcareous; erosional. BCA 80°.
- 405 - 407.5 Mudstone: medium grey; very slightly silty; non laminated; carbonaceous at 407 - 407.5; strongly calcareous; gradational.
- 407.5 - 409.5 Sandstone: medium grey; upper 1' very fine grained; lower half very silty and argillaceous; 0.6' mudstone in middle, slight burrowing; discontinuous lamination, strongly calcareous, gradational.
- 409.5 - 411 Mudstone/Siltstone: brownish grey, about equal proportions, structureless, 1" fine grained sandy band at base, strongly calcareous, abrupt.
- 411 - 411.5 Mudstone: black, highly carbonaceous, coaly stringers, abrupt below.
- 411.5 - 427.2 Sandstone/Siltstone: medium grey, dominantly very fine grained and very argillaceous (10 - 15%), abundantly laminated, silts also argillaceous and may constitute one third of total interval, few inches of fine sands 2.5' above the base, locally slightly burrowed and large discrete burrows, strongly calcareous throughout, very transitional below.
- 427.2 - 429 Sandstone: light/medium grey, initial half medium grained, rest fine grained, clean, mostly homogeneous, strongly calcareous, gradational.

- 429 - 450 Siltstone/Silty Sandstones (very fine grained) and silty mudstones, all lithologies imperceptibly blending into one another, fine sands at 440 - 440.2; 440.7 - 441; and 442 - 442.5. Apart from the latter zones there are smaller stringers of fine sands at various intervals. Fine sand generally devoid of lamination and many exhibit mottled and bioturbated features. Small scale slumped lamination, strongly calcareous, gradational. BCA 60°. Core fractured and calcite encrusted at 436 - 437.8.
- 450 - 459 Sandstone: light medium grey; very fine to medium in layers; top half very fine laminated; lower half medium with some intraclasts of silt; shattered 455' to 457'; BCA 55°, strongly calcareous.
- 459 - 465 Mudstones: medium grey; silty, slickensided, non calcareous.
- 465 - 486 COAL - Clarodurain and durain intervals.
 Recovery: 465 - 467 .2
 467 - 470 .3
 470 - 473 .3
 473 - 477 1.7
 477 - 481 1.0
 481 - 483.5 nil
 483.5 - 484.5 .4 (mostly mudstone)
 484.5 - 486 .8 (50% mudstone)
- % recovery: 4.7' / 19' = 25%
Note: Interval 484.5 to 486 has "not" been sampled.
- 486 - 490 Siltstone/Sandstone (very fine grained); light medium grey; middle 18" very fine; argillaceous sandstone; remainder is very argillaceous siltstone; calcareous; gradational.
- 490 - 497 Mudstones: grey/black; silty, no structure; strong calcareous save bottom 1' gradational.
- 497 - 497.5 COAL
- 497.5 - 500.5 Mudstone: dark grey; carbonaceous, coal stringers; bottom 1' calcareous, abrupt lower contact.

- 500.5 - 507.5 Sandstones: light medium grey; initial 1.5' very fine grained; rest fine to medium grained; well cross laminated; large silty intraclasts; coaly laminations near bottom; fracturing and calcite veining throughout; strong calcareous, abrupt below.
- 507.5 - 512.5 Mudstones: medium dark grey; sand and silt intercalations especially top 2.5'; locally carbonaceous; strongly calcareous; gradational; BCA 60°.
- 512.5 - 518 Sandstones: light medium grey; middle 2' fine grained; rest very fine grained; argillaceous; abundantly small scale cross lamination; strong calcareous; gradational.
- 518 - 532 Mudstone: dark grey to black; slightly silty; some sandy layers; carbonaceous and bone coal 524 to 527'; silty/sandy areas calcareous; abrupt below.
- 532 - 534.5 Sandstone: medium grey; very fine grained; some silt laminations; fracture at 534'; strong calcareous; abrupt below.
- 534.5 - 535.8 Mudstone: black, structureless; slightly calcareous; abrupt below.
- 535.8 - 544 Sandstone: medium grey; very fine grained; argillaceous; discontinuous laminations; strong calcareous; abrupt.
- 544 - 552.8 Mudstones: brownish grey (first 3'), rest black; locally carbonaceous especially bottom 4'; silty layers and areas; sporadically calcareous, continuous below.
- 552.8 - 555.5 COAL/Mudstones: 554.5 to 555.2 mudstone zone.
- 555.5 - 558 Mudstone: dark grey, locally carbonaceous, gradational.
- 558 - 564 Mudstones: medium grey, very silty, a stringer of very fine sand, strongly calcareous, gradational.
- 564 - 568 Sandstones: medium grey, very fine grained, highly argillaceous (10-15%), strongly calcareous, gradational.

- 568 - 574 Mudstones: medium/dark grey, very silty and locally sandy, strongly calcareous.
- 574 - 618 Sandstones: medium grey, very fine grained and abundantly argillaceous (15%) and evenly dispersed throughout as laminae and layers. Abundant wavy parallel to cross lamination, much burrowing locally, sporadic fracturing, bottom 1.5' highly fractured and recemented. BCA variable, steepest angle at 605' - BCA 20°, strongly calcareous.
- 618 - 678 Sandstones: light grey, predominantly medium grained, generally clean and well washed, very characteristic is the recurrence of very thin coaly layers along with rock movements occurred and hence the fragmentary nature of sandstones. Some zones incorporate abundant large to medium shaly/silty intraclasts. Interval 665.5 - 671 coarse to very coarse grained; at 671 - 673 and 676 - 678 granular to gritty and very finely pebbly conglomerate; mostly strongly calcareous, siliceous 673 - 676; abrupt and erosional lower contact. Variable BCA 40°.
- Repeat of section ? fault/fold.
- 678 - 713 Sandstones: light grey, generally clean, fine grained from 678 - 690, medium grained 690 - 700, rest medium to very coarse grained and locally finely pebbly, abundant fine coaly intercalations along which slippage took place, whole interval identical to above. Lower contact sharp and erosional. Bottom 0.5' has some ¼" to ½" long pebbles. Variable BCA 20° - 40°.
- 713 - 716 Sandstones: medium to dark grey, very fine grained, wavy to irregular lamination, argillaceous 15 - 20%, appears to have a finely powdered carbonaceous matter intermittently mixed with the matrix. BCA 45 - 50°.
- 716 - 737 Mudstone: dark grey, homogeneous, slightly silty, sparingly calcareous, gradational.
- 737 - 764 Coal/Mudstone: This interval has 40 - 50° BCA; many muddy bands notably at 750.5 - 753. Much of coal dirty, gradational, seam not sampled.

764 - 938

Mudstones: generally dark grey, locally very carbonaceous and thin coaly layers; very finely sandy at 812 - 823; 870 - 875; 890 - 893. Also silty at places. BCA at 764 - 777 generally at 50° but rest of sequence at 10 - 15°. Because of very high angle it is apparently disproportionately represented. Many rusty weathering zones, silty/sandy zones to well cross laminated and laminated, strongly calcareous throughout.

T. D.

DH 75 - 7

- 0 - 74 Triconed
- 74 - 90 Mudstone: dominantly dark grey, at two levels brief sandstone zones but badly weathered, some black muds with abundant coalified plant debris, mostly non calcareous, very gradational.
- 90 - 96 Mudstone/Coaly Zone: initial 1.5' very carbonaceous and with considerable coaly layers, rest black carbonaceous muds. Less than 50% recovery in entire zone.
- 96 - 106.5 Mudstone: initial 5' medium grey, very slightly silty and middle 1' very carbonaceous, remainder very silty (25 - 30%) and 0.5' very fine sandstone. Lower 3' very calcareous, rest mainly non calcareous, very transitional.
- 106.5 - 112 Sandstone: light/medium grey, fine to very fine grained, abundantly cross-laminated, locally richly argillaceous especially middle 1' and bottom 1', locally slight obliteration of laminae due to burrowing, strongly calcareous, transitional. BCA 75°.
- 112 - 127.5 Mudstone: dominantly black, carbonaceous and coaly stringers throughout, very silty in lower 2' and strongly calcareous, rest non calcareous, structureless, very gradational.
- 127.5 - 137 Sandstone/Mudstone: light/medium grey; broadly alternating (up to 1.5') bands of very fine sands and silty muds, some disturbance and penecontemporaneous disturbance of laminae, very few isolated burrows, strongly calcareous throughout, gradational. BCA 75°.
- 137 - 145 Mudstone: medium to dark grey, lower half abundantly silty and thin very fine sand layers, strongly calcareous, gradational.
- 145 - 148 Sandstones: light/medium grey, very fine-grained, much argillaceous intercalations, some burrowing, bottom 1.3' very silty, calcareous.
- 148 - 155.5 Mudstone: medium grey, silty (up to 30%), structureless, calcareous.

- 155.5 - 164 Coal/Carbonaceous Mudstone: very dirty coal interlayers with muds.
- 164 - 175.5 Mudstone: initial 5' medium grey and silty (homogenously), 1.5' black slightly carbonaceous muds, remainder at base richly silty and sandy (very fine), locally laminated, mostly strongly calcareous, gradational.
- 175.5-179.5 Coaly mudstone: black, upper half dominantly coaly and very dirty, rest richly carbonaceous muds, gradational.
- 179.5 - 183 Mudstone: black, initial half silty and medium grey, remainder black and locally very carbonaceous, gradual.
- 183 - 197 Sandstone: medium grey, very fine grained, highly argillaceous, initial 7' has up to 30% silty/shaly content. Interval 190 - 195 has peculiar dendritic patterns, apparently caused by local slumping and compaction - much bioturbation and obliteration of small scale cross-lamination. Bottom 2' incorporates several shaly layers, strongly calcareous.
- 197 - 203.5 Siltstones: dark grey to black, argillaceous (15-20%), bottom 2' has regular and fine sand layers, strongly calcareous, shattered bottom contact.
- 203.5 - 208 Sandstone: medium grey, initial 1.5' broken up, rest of sand fine grained and characterized by regular recurrence of carbonaceous laminae and occasional coaly lens, strongly calcareous, bottom shattered along coaly intercalations. BCA 55°.
- 208 - 211.5 Siltstone: dark grey, richly argillaceous, seem to have been bioturbated, strongly calcareous, gradational.
- 211.5 - 212.5 Sandstone: medium grey, fine grained, finely broken up carbonaceous matter, similar to 203.5 - 208 interval, calcareous, erosional below.

- 212.5 - 223 Mudstone: dark grey to black, a completely shattered and recemented zone (breccia) at 213 - 214, very carbonaceous and 0.3' bony coal in 214 - 218; rest sparingly carbonaceous.
- 223 - 248 Sandstones: medium grey, very fine grained, initial 6' have 30% silty/argillaceous content, rest relatively clean, abundant small scale cross-lamination, sporadic burrowing, a vertical fracture at top, bottom 2' also very argillaceous, strongly calcareous, transitional.
- 248 - 251.5 Coal/Mudstone: less than 50% recovery, gradational.
- 251.5 - 256 Sandstone/Siltstone: medium grey, initial half very fine sands, richly argillaceous, laminated, rest silty, gradational.
- 256 - 267 Mudstone: dark grey, muddy/sandy at 262.5 - 264.5, initial half sporadically calcareous, rest non calcareous.
- 267 - 281 Sandstone: medium grey to brownish grey, initial 8' very fine grained, frequent argillaceous lamination, ubiquitous cross lamination and wavy, remainder fine grained and cleaner, strongly calcareous, gradational. BCA 60°.
- 281 - 289 Mudstones: medium to dark grey, locally slightly rusty looking and occasionally nodular (defined by rusty blotches), non calcareous, bottom 1' richly silty (30 - 35%), homogenously mixed, very gradational.
- 289 - 300 Sandstones: brownish grey, fine to very fine grained, initial 4' with abundant argillaceous matter, uniformly mixed and generally impoverished in lamination, rest cleaner, laminated at intervals, occasional small burrowing - one very large (3" deep 2" wide) burrow, strongly calcareous. BCA 65°.
- 300 - 307 Sandstone: light grey, medium grained, clean and mostly siliceous, dominantly cherty, a fracture in middle, bottom 2' fine/medium grained and strongly calcareous, fining lower end, fractured at base.

- 307 - 311.5 Sandstones: medium grey, fine grained, cross laminated lower end very fine grained, interval throughout traversed by calcite veins, much shearing and healing. BCA in this zone abruptly changes - it appears some dislocation has taken place. Bottom 2" brecciated, calcareous, abrupt polished contact. BCA 30°.
- 311.5 - 316.2 Siltstones: medium grey, initial 1' very muddy, rest regularly argillaceous, and has parallel to ripple lamination, upper 1' broken up and partially calcite encrusted, strongly calcareous, interbedding below. BCA 45°.
- 316.2 - 333.5 Sandstone: light/medium grey, initial 10' very fine grained, locally well laminated, argillaceous, rest fine grained and lighter coloured; interval 325.5 - 333.5 intermittently broken up and has extensive calcite veining; BCA 10°; strongly calcareous, discontinuous below. Some dislocation along this zone.
- 333.5 - 352.5 Mudstone/Coal Zone: black; fragmented, stringers and zones of coal; recovery 333.5 to 348: 35%; 348 - 352.5: silty mudstone, sporadically calcareous; gradational below.
- 352.5 - 356.2 Siltstones: medium grey, argillaceous; initial half carbonaceous; appears paleosoil lithology; laminations rare; non calcareous; gradational below.
- 356.2 - 374.5 Sandstones: very fine grained; light grey; argillaceous (25%) laminated; great amount of bioturbation and burrowing; carbonaceous at 368.0 to 368.5; calcareous; BCA 78°.
- 374.2 - 377 Sandstones: fine grained/ medium grey; ripple, carbonaceous laminations; abrupt below; calcareous.
- 377 - 387 Mudstones/Siltstones: initial 5' argillaceous siltstones; thin layers of sand; rest is black mudstones; carbonaceous; upper part calcareous; lower not; gradational below.
- 387 - 398.5 Sandstones: mediy grey; very fine grained; argillaceous (30%); very silty; small scale cross and ripple laminations; locally burrowed; BCA 80°; calcareous; gradational.

298.5 - 399.5	COAL: clarodurain; gradational to -
399.5 - 400.2	Mudstone: black; carbonaceous; abrupt below.
400.2 - 403	Siltstones/Sandstones: very fine grained; argillaceous; laminated; calcareous, very gradational.
403 - 405.5	Siltstones: light grey; argillaceous; laminated; calcareous; very gradational.
405.5 - 414	Mudstones: medium grey to black; very silty especially at 410 to 412; carbonaceous bottom 2.5'; upper half sparsely calcareous, below not; gradational.
414 - 420	Sandstones: brownish grey; very fine grained; very silty especially bottom 2.0'; laminated; cross laminated; calcareous; gradational.
420 - 427.2	Sandstones: medium grained; light grey; clean looking; uniformly cross laminated; few silt intraclasts in bottom 1.0'; strongly calcareous; few burrows; abrupt; erosional below.
427.2 - 428.5	Mudstones: black; carbonaceous, gradational.
428.5 - 444.5	Sandstones: light grey; fine grained to 439; rest medium grained; clean; uniformly cross laminated; silty in middle; initial 3.0' has 20% mud content; slump lamination; occasional silty intraclasts; strong calcareous except initial 3.0'; BCA 80°; abrupt below.
444.5 - 448.5	Mudstones: dark grey; silty and fine sands; poorly laminated; non calcareous; lower end carbonaceous; gradational; 1.0' coal at 446.
448.5 - 472.5	Sandstones: medium grey; very fine grained; locally fine grained (few inches thick); interlaminated silts; muds; cross laminated; slumps; 0.5' carbonaceous mudstones at 461; BCA 75°; calcareous; gradational below.
472.5 - 473.8	Mudstones: coaly, black, gradational.
473.8 - 497	Sandstones/Siltstones: medium dark grey; very fine grained; argillaceous; much carbonaceous intermixed material; laminated; top. 9.0' non calcareous, rest calcareous; abrupt below.

- 497 - 499 Sandstones: light grey; clean; medium; cross laminated; calcareous; abrupt.
- 499 - 514 Sandstones: medium grey; very fine grained; argillaceous; silty bands; cross laminated; calcareous; 511 to 512 fine, silty intraclasts; erosional below.
- 514 - 524 Mudstones: medium to dark grey; silty and very fine sands at 516.6 to 518; carbonaceous; structureless; non calcareous; gradational below.
- 524 - 525.5 COAL: durain, recovery 90%.
- 525.5 - 542 Sandstones: light to medium grey; initial 1' argillaceous into 1.5' medium grained clean sandstones; rest very fine grained; and very argillaceous; 533 to 536 fine to medium clean sands; cross laminated; calcareous; gradational below; BCA 75⁰.
- 542 - 547 Sandstones: medium grey; very fine grained; silty; carbonaceous and plant debris; argillaceous (highly); few laminations; initial 1.2' muddy; calcareous; gradational below.
- 547 - 550 Mudstones: black; carbonaceous; non calcareous; gradational.
- 550 - 554.6 Sandstones: very fine grained; silty; medium dark grey; rootlet-like structures; argillaceous; siliceous; lower calcareous; gradational.
- 554.6 - 559 Sandstones: light grey; upper half fine clean; lower very fine argillaceous; laminated; strongly calcareous; gradational.
- 559 - 561 COAL/Carbonaceous Mudstone: gradational below.
- 561 - 574 Siltstones/Mudstone: 50/50; very fine sandstone at 568.5 to 570; lower 2.5' coaly, carbonaceous; calcareous where sandy and silty; gradational.
- 574 - 577.8 Sandstones: medium grey; medium grained; argillaceous (slightly); poorly cross laminated; calcareous; abrupt.

- 577.8 - 592 Mudstones/Siltstones: 50/50; dark grey; muds carbonaceous; sandy layers 579 to 581; calcareous in patches; gradational.
- 592 - 600 Sandstones: fine grained; medium grey; argillaceous in middle; initial 2.5' bioturbation; strongly calcareous; very transitional below.
- 600 - 607.5 Sandstones: light grey; clean; medium grained; cross laminated; well sorted; strongly calcareous; abrupt below.
- 607.5 - 610.5 Siltstone/Mudstone: medium grey; irregular laminations; strongly calcareous; gradational.
- 610.5 - 617 Mudstone: black; coaly; carbonaceous stringers; locally silty; sandy at 612 to 613.5; patchy calcareous; gradational.
- 617 - 624 Sandstone: medium grey; very fine grained; cross laminated; top 1.5' silty; middle 1.0' muddy with coal; strongly calcareous; gradational; BCA 50°.
- 624 - 626.4 Mudstones: black; carbonaceous; gradational.
- 626.4 - 632 Sandstone: fine grained, medium grey; silty; argillaceous; laminated; calcareous. BCA 65°.
- 632 - 633.5 Carbonaceous Mudstones: silty; transitional below.
- 633.5 - 638 Sandstones: light grey; medium grained; well sorted; cross laminated; clean; bottom 1.5' intraclasts of silt; argillaceous; strongly calcareous; abrupt below.
- 638 - 644 Sandstones: medium grey; initial 3.0' very fine grained, argillaceous, cross laminated; rest medium grained cleaner; strongly calcareous; erosional below.
- 644 - 652 Mudstones: medium dark grey; initial 1.5' carbonaceous; rest silty; no lamination; calcareous; gradational.
- 652 - 655 Sandstones: very fine grained; medium grey; small scale cross lamination; 2" lenses of burrowed sandstones (sand infilled) vertical large burrows; strongly calcareous; gradational.

- 655 - 659 Mudstones: medium grey; silty (20%); calcareous; gradational.
- 659 - 664 Mudstones: black; initial 2.0' coaly; rest carbonaceous; gradational.
- 664 - 668.5 Siltstones/Mudstones: initial 1.5' dark grey siltstones with rootlets into 1.5' very fine grained laminated argillaceous sandstones; few burrows; rest mudstones; non calcareous.
- 668.5 - 669.5 COAL - durain and clarodurain.
- 669.5 - 694 Sandstones: medium grey; dominantly very fine grained; intercalations of silts; cross laminated; some areas homogenous; burrowing; silty intraclasts; few pebbles 689; broad interbedding transitional below; strongly calcareous. BCA 75⁰.
- 694 - 714 Sandstone: medium to coarse grained, light grey; very clean; well sorted; cross bedded; cherty (30%); pebbles isolated maximum 1" x 1.5" generally $\frac{1}{4}$ " diameter; 708.5 to 710.5 very pebbly and granular; siliceous; abrupt below.
- 714 - 720 Sandstone: medium grey; very fine grained; argillaceous especially top 4'; few laminations; calcareous; gradational.
- 720 - 729.3 Sandstone: light grey; fine grained; clean; cross laminated; well sorted; lower 5' very fine argillaceous intraclasts; strongly calcareous; abrupt.
- 729.3 - 732 Mudstones: dark grey to black; upper half carbonaceous; lower half silty; gradational.
- 732 - 736.5 Sandstones: medium grey; medium grained; clean; obscurely cross laminated; mild calcareous; gradational.
- 736.5 - 742 Mudstones/Siltstones: 67/33; calcareous; gradational.
- 742 - 779.5 Sandstones: light grey; medium grained; clean; well sorted in any interval; obscurely cross laminated; cherty 40%; siliceous; pebbles at 770.5; 778 to 779.5; middle 5' sparsely dispersed coaly shards; BCA 75⁰; abrupt below.

- 779.5 - 783 Siltstone/Mudstone: upper 2.5' siltstone; argillaceous; rest mudstone; abrupt below; calcareous.
- 783 - 787 COAL - durain, recovery 25%.
- 787 - 791 Mudstones: dark grey to black; lower silty; carbonaceous; non calcareous; gradational below.
- 791 - 793 Sandstones: medium grey; very fine grained; argillaceous; calcareous; gradational.
- 793 - 798 Mudstones: dark grey; silty; argillaceous; non calcareous; gradational.
- 798 - 804 Siltstones: medium grey; argillaceous; non laminated; calcareous; abrupt.
- 804 - 821 Sandstone: medium grey; fine grained; small scale cross lamination; clean; calcareous; transitional below.
- 821 - 836.5 Sandstones: medium grey; medium grained; lower 10' abundant pebbles and granular zones; argillaceous; abrupt; BCA 800.
- 836.5 - 865 Silty Mudstones: medium to dark grey; structureless; uniform looking; strongly calcareous; carbonaceous intervals; gradational.
- 865 - 895 Sandstones: medium grey; initial 10' very fine grained with thin shales; rest fine grained; clean; cross laminated; silt intraclasts 882 - 883 and 893 - 893.5; calcareous; BCA 750; abrupt below.
- 895 - 904 Mudstones: black; coaly; non calcareous; abrupt below.
- 904 - 908 Sandstone: fine to coarse grained; granular and gritty locally; laminated; calcareous; abrupt (erosional?).
- 908 - 927 Mudstone: medium grey; silty; structureless; non calcareous; gradational.
- 927 - 939 Siltstones: medium grey; argillaceous; chaotic look; paleosoil?; non calcareous; gradational.

939 - 945	Mudstones: medium grey; silty; upper non calcareous; lower half calcareous; gradational.
945 - 948	Mudstones: black; carbonaceous; some hard dirty coal; gradational.
948 - 955	Mudstones: non calcareous; structureless; gradational.
955 - 972	Siltstones/Mudstone: dark grey; silty upper half; laminated; coal at 1.0' above base; non calcareous; gradational.
972 - 976	Mudstone: black; carbonaceous; gradational.
976 - 985	Siltstone/Mudstone: well laminated; many burrows; strongly calcareous; gradational.
985 - 989	Mudstones: black; carbonaceous; non calcareous; gradational.
989 - 998	Mudstone: silty; medium grey; coaly stringers; calcareous; gradational.
998 - 1004	Sandstones/Mudstone: medium grey; silty laminated; strongly calcareous; gradational.
1004 - 1007.5	Mudstones: silty; non calcareous; gradational.
1007.5 - 1014.5	Siltstone: initial 2.5' light grey; rest dark grey; argillaceous and carbonaceous; no lamination; upper 2.5' calcareous; rest non calcareous; gradational.
1014.5 - 1026	Sandstone: medium grey; very fine grained; cross laminated; ripple lamination; burrows; lower 2.4' medium grained; graded intervals; coal stringers; calcareous; scoured below.
1026 - 1032	Mudstone: black; coaly carbonaceous; pyrite clasts; lower half calcareous; gradational.
1032 - 1039	Mudstone/Siltstones: very fine grained, argillaceous sands at 1037 to 1038.5; laminated sparsely; strongly calcareous; BCA 60°; gradational.
1039 - 1042	Mudstone: medium grey; carbonaceous; lower silty and laminated; strongly calcareous; abrupt.

1042 - 1043	COAL
1043 - 1051.5	Siltstone/Mudstone: muds greater; interbedded; laminated locally; fracture at 1046.5; calcite veining at 1046.5; BCA 70°; gradational.
1051.5 - 1057	Mudstone: black; upper carbonaceous, lower 1.5' silty; calcareous patches; gradational.
1057 - 1059.3	Siltstone: medium grey; no laminations; strongly calcareous; gradational below.
1059.3 - 1065.5	Mudstones: dark grey to black; top coaly; some coal lost? (approximately 3.0'); silty; poorly laminated; non calcareous; gradational.
1065.5 - 1081	Mudstones: dark grey to black; initially silty; carbonaceous locally; gradational.
1081 - 1087	Siltstone/Sandstone: medium grey; silty, richly argillaceous; 1.5' very fine grained sands; well laminated; strongly calcareous. BCA 80°.
1087 - 1100	Mudstone: dark grey; silty (homogenously); non calcareous; gradational.
1100 - 1105.5	Siltstone: medium grey to dark grey; argillaceous content 10% intimately throughout; non calcareous; very gradational.
1105.5 - 1111.5	Mudstone: dark grey to black; carbonaceous, non calcareous; structureless; gradational.
1111.5 - 1116	Mudstone: black, initial 0.5' sandy; gradational.
1116 - 1125	Siltstone/Mudstones: medium grey; alternating; laminated; silts have erosional contacts with muds; erosional below; 0,8' sandstone in centre.
1125 - 1127	Mudstone: black; silty; calcareous; BCA 75°.

T.D.

DH 75 - 8

0 - 36	Triconed.
36 - 100	Boulders; till; (rubble?).
100 - 109	Sandstones: medium grey; very fine grained; calcareous; argillaceous, weathered and broken; gradational.
109 - 111	Mudstones; broken.
111- 114	Sandstones: medium grey; very fine grained; laminated; argillaceous, calcareous.
114 - 118	Shale: dark grey; weathered and disaggregated; 50% recovery.
118 - 118.7	Carbonaceous Mudstone; coaly.
118.7 - 124	Sandstone: Siltstone; medium grey; very fine grained; argillaceous; lamination wavy; lower decayed and weathered; calcareous; BCA 87 ⁰ .
124 - 140.5	Sandstone: light grey; fine grained; well cross-laminated; sandy; mudstone at 128 to 130.5; lower 1' is medium grained with shales interlayered; abrupt below; calcareous.
140.5 - 148	Sandstone/Mudstone: medium grey; sands fine grained; intimately associated with muds; laminated; calcareous; gradational.
148 - 149	Sandstones: medium grey; fine grained; cross laminated; carbonaceous matter to bedding; strong calcareous; gradational.
149 - 152	Mudstone: dark grey; silty; carbonaceous; coal stringers; calcareous.
152 - 156	COAL? 0% recovery.
156 - 160.5	Mudstones: black; carbonaceous; non calcareous mostly; gradational.
160.5 - 162.5	Mudstones: medium grey; silty; calcareous, gradational.

- 162.5 - 227 Mudstones: dark grey; locally carbonaceous and coaly; little silt; structureless; BCA 80°; — non calcareous except last transitional foot.
- 227 - 237.8 Sandstone/Siltstone: muddy; medium grey; very fine grained sands; slightly laminated; few coal lenses; "bentonite look". (0)
- 237.8 - 246 Mudstone/Coal: 15% recovery; possibly all good coal lost.
- 246 - 247 Sandstone/ bentonitic look; medium grey; gradational. (?)
- 247 - 253.5 Mudstones: dark grey; silty; some carbonaceous zones; laminated.
- 253.5 - 260 Siltstone/Sandstone: medium grey; laminated argillaceous siltstone; very fine grained sandstone; calcareous.
- 260 - 268 Siltstones/Mudstones; mediy grey; layers; silty at top; muddy at bottom; calcareous; gradational.
- 268 - 269 Bone Coal - (not sampled).
- 269 - 278 Coal: Recovery 70%.
- | | |
|------|---|
| 1.5' | Durain |
| 1.0' | Clarodurain |
| 0.2' | Siltstone/mudstone (not included in sample) |
| 2.3' | Clarodurain |
| 1.0 | Clarain |
- 278 - 288.5 Mudstones: black; coaly; non calcareous; gradational below.
- 288.5 - 293 Sandstone: medium grey; very fine grained to silty; argillaceous; rootlet-like markings; non calcareous; gradational.
- 293 - 308 Mudstone; dark grey; sandy; locally carbonaceous; non calcareous; gradational below.
- 208 - 315 Sandstone: medium grey; laminated; very fine grained; argillaceous; calcareous; BCA 70°. —

315 - 322	Mudstone: medium grey; silty layers; calcareous; transitional below.
322 - 325	Siltstone: argillaceous; lower half very fine sands; laminated; medium grey; strongly calcareous; gradational.
325 - 327.5	Mudstones: dark grey; silty; coaly stringers; strongly calcareous; gradational.
327.5 - 337	Siltstone: medium grey; mudstones interlayers; non calcareous; gradational.
337 - 343	Mudstones: dark grey; non calcareous; gradational.
343 - 345.8	COAL: Recovery 30%; hard; dirty.
345.8 - 349	Carbonaceous Mudstones: Recovery 30%.
349 - 350	Sandstone: cross-laminated; very fine grained; argillaceous; calcareous.
350 - 372	Mudstone: black; fractured; carbonaceous areas; coal stringers; 1.0' siltstone at 365 and 367 to 368; non calcareous; abrupt.
372 - 387	Sandstone: light grey; fine to medium grained; calcareous; coarse grained bottom 383'; cross-lamination; clean, well-sorted bottom 10'; top 7' very fine grained; burrows; distinctive unit; erosional contact (abrupt).
387 - 432	Mudstone: dark grey; silty patches; broken up; carbonaceous; coaly towards bottom (10'); calcareous upper.
432 - 438	Coal. Recovery 70%
433 - 434	Detrital carbonate particles throughout; also sandy and shaly clasts; "oolitic" type of structure; calcareous.
1.0'	Clarodurain
1.0'	Detrital coal
4.0'	Clarodurain
438 - 451	Mudstone: dark grey; silty; carbonaceous; calcareous; structureless.

- 451 - 459 Sandstone: very fine grained; medium grey; argillaceous; shattered and slickensided bottom 1.5' (fault?); calcareous.
- 459 - 465 Mudstones: medium grey; silty top; calcareous where silty; fragmented core bottom.
- 465 - 473.5 Sandstone: light grey; top 3' very fine grained and argillaceous; rest cleaner; fine grained; core shattered 469.5 to 472; interbedded bottomwards; gradational (?).
- 473.5 - 487 Siltstones/Mudstones: dark grey; laminated where silty; some differentiated silts towards bottom; calcareous where silty; BCA 70°.
- 487 - 497 Sandstone: light grey; fine grained; locally very fine grained; clean; some coal stringers; cross laminated; silt intraclasts; strong calcareous; gradational.
- 497 - 502 Mudstone: dark grey to black; carbonaceous; broken up; some slickensides; non calcareous; abrupt and polished at bottom.
- 502 - 509.5 Sandstones: medium grey; very fine grained; cross laminated; carbonaceous; silty intraclasts bottom 1.0'; fracture in middle; calcareous; scoured below; BCA 80°.
- 509.5 - 525 Sandstone/Siltstone: medium grey; very fine grained; rootlet-like structures; calcareous; coaly lenses; gradational.
- 525 - 533 Mudstone: medium grey; silty; strongly calcareous; structureless; bottom 5' are carbonaceous and non calcareous; 528 - 532; 50% recovery.
- 533 - 538.5 Coal: Recovery 45% - durain.
- 538.5 - 577.5 Mudstone; dark grey; carbonaceous locally; coaly stringers; sandy at 549.5 to 550.5; and 560 to 561; recovery between 563 to 568 - 60%. BCA 75°. Calcareous where silty, otherwise non calcareous.

- 577.5 - 596 Sandstone: medium grey; very fine grained to silty; muddy; intervals of silty mudstone; locally laminated; core shattered; gradational; calcareous.
- 596 - 599 Mudstone: dark grey; silty; bottom black; carbonaceous; rest calcareous; gradational.
- 599 - 603 Coal/Sandstone/Carbonaceous mudstone: sands micaceous; very fine grained; coaly stringers, bentonitic look; 2.0' of core lost (coal?).
- 603 - 620.5 Sandstone: medium grey; very fine grained; mudstone bands; cross-laminated; local gradations from silt to mud; core shattered 613.5 with calcite veins. BCA 55° on one 3" piece; rest shows BCA 70°; calcareous gradational.
- 620.5 - 627 Mudstones: dark grey; silty (locally); finely sandy; some laminations; strong calcareous; gradational.
- 627 -643 Sandstone: medium to dark grey; very fine grained with silty intervals; locally muddy especially 635 - 638; wavy to irregular lamination; locally vertically fractured, sparingly carbonaceous in bottom 5'; strongly calcareous; BCA variable: 60 to 55°; gradational.
- 643 - 663 Mudstone: dark grey; locally silty; broken up; coaly stringers; slickensided at 650.5; calcareous; laminated; sandy (very fine grained) intervals.
- 663 - 677 Coal: Recovery 45%.
- | | | |
|-----|------|--|
| 663 | 1.0' | Carbonaceous mudstone/coal (not sampled) |
| | 1.5' | Mudstone (not in sample) |
| | 2.0' | Durain |
| | 0.5' | Clarodurain |
| 677 | 1.0' | Hard, dirty coal. |
- 677 - 699.5 Mudstone: dark grey; carbonaceous; coal stringers; 691.5 to 695 rusty, silty and calcareous; bottom 1.5' very silty and calcareous; rest non calcareous; very transitional.

- 699.5 - 716 Siltstones/Mudstones: BCA 55⁰; upper muddy, lower silty; medium grey; very fine sandy laminated upper 10.0'; 710 to 712, silty intermixed with very fine sands; bioturbation removing all structure; strongly calcareous; very transitional below.
- 716 - 737.5 Sandstone: light grey; lower 5' medium grey; very fine grained 716 to 721 then fine grained; laminated and cross-laminated; 727.5 to 729.5 dark carbonaceous laminae; bottom .5' silty intraclasts and coaly streaks; 730.6 to 731.6 silty mudstone band; strongly calcareous; erosional below; mudstones; 732.5 to 733.0; 733.5 to base very fine grained intermixed with silty mudstone layers; BCA 70⁰.
- 737.5 - 750.5 Mudstones: black; carbonaceous; coaly bottom 2.5'; upper locally calcareous; rest non calcareous; gradational.
- 750.5 - 756 Siltstone: initial 2.5' dark grey; middle 1.5' light grey; lower 1.5' medium grey; argillaceous top and bottom; finely admixed carbonaceous matter; structureless; lower 1.5' homogenous; non calcareous; very gradational below.
- 756 - 760 Sandstone: light grey; fine grained; laminated; carbon intercalations; siliceous; gradational; silt clasts 759.0' .
- 760 - 762 Mudstone: black; carbonaceous; structureless; non calcareous; gradational.
- 762 - 775 Siltstones/Mudstones: medium grey; upper 2.5' silts and very fine sands; argillaceous; laminated; rest muds and muddy silts with two 6" bands very fine sands; 766.5 to 767.5 carbonaceous; calcareous; gradational; BCA 60⁰.
- 775 - 791.5 Sandstones: medium grey; fine to very fine grained; small scale cross-lamination; lower 5.0' distinctive; ubiquitous inclusions of coaly shards; core yielding along coaly layers (more than 5 mm); 753 to 788 muddy elongate intraclasts; argillaceous upper sequence; vertical fractures 776 - 778 and 780 to 781.5; which are partially calcite rehealed; minute displacement, strongly calcareous except lower 2.0'; abrupt below.

- 791.5 - 802.5 Mudstone: dark grey; coaly shards encrusted with calcite; silty rusty; non-laminated; strongly calcareous; gradational.
- 802.5 - 804 Mudstone(carbonaceous)/Coal: gradational.
- 804 - 814.5 Sandstone (very fine)/Siltstones: medium grey; argillaceous (25%); regular alternating bands of silt and sand; cross lamination locally but most sedimentary structures removed; strongly calcareous; gradational BCA 60°.
- 814.5 - 818 Mudstone: black; richly carbonaceous; coaly stringers; calcite and breccia (1.0') at base with siltstone clasts; calcareous; abrupt below.
- 818 - 827 Mudstones: black; coaly; polished surfaces and slickensides; non calcareous; gradational below.
- 827 - 847 Mudstones: dark grey to black; locally carbonaceous; thin coal stringers; lower 1.5' silty; structureless; rusty locally; calcareous; gradational below.
- 847 - 870.5 - Siltstones: medium grey; initial 5' very argillaceous, (up to 20%); much sands - very fine grained; argillaceous; vague to poorly laminated and locally vaguely bioturbated sandy units imperceptibly changing to silts. A local 0.3' silty band peculiarly intertwined with calcite veins, strongly calcareous, very gradational. BCA 65°.
- 870.5 - 876.5 Mudstones (silty); medium grey; silts 25%; sparsely laminated (vaguely); ripple lamination; slight burrowing; strongly calcareous; gradational.
- 876.5 - 886 Sandstone: medium grey; highly argillaceous; has as regular bands with erosional contacts with sands; local extensive burrowing and laminae modification; remnant lamination; very fine grained; ripple cross lamination; strongly calcareous; very transitional; BCA 55°.
- 886 - 891.5 Siltstone: dark grey; argillaceous; middle coal stringer; thin shales lower; broken lower 1.0' slumping; strongly calcareous, gradational below.

- 891.5 - 894 Sandstones: light grey; very fine grained; finely laminated and rippled; argillaceous; grades to silts locally; strongly calcareous; gradational.
- 894 - 899.5 Siltstones/Mudstones: 50/50; upper 2.0' finely laminated sands, silts; 897 to 899.5 black, carbonaceous; upper 3.0' calcareous; gradational.
- 899.5 - 907 Mudstones: black; very carbonaceous; coaly stringers; polished surfaces; non calcareous except 904 to 905.5; very gradational.
- 907 - 909 Coal/Mudstone: 50/50;
- 909 - 922 Siltstones: medium grey; muddy; poorly laminated; 922.5 to 913.5 cleaner and light grey silts; lower 3.0' very fine sandy layers; sporadically calcareous; gradational.
- 922 - 933 Mudstones: dark grey; carbonaceous; coaly intercalations 926 to 928; non calcareous; gradational; BCA 60°.
- 933 - 934.5 Coal: recovery 100% to 95% clarodurain; gradational.
- 934.5 - 945 Mudstones: dark grey; brownish grey (vaguely) banded; silty; strongly calcareous; abrupt below.
- 945 - 946.5 Coal: Recovery 70% clarodurain.
- 946.5 - 948 Mudstone: black; silty; carbonaceous; calcareous .5' lower; gradational.
- 948 - 963 Sandstone: light to medium grey; very fine grained; alternating bands muds and silts; abundantly small scale cross laminated; locally bioturbated; rootlet-like structure; isolated burrows; erosional contacts sands with muds; local slumping; abrupt (erosional?) below.

- 963 - 981 Mudstones: initial 5.0' silty and finely sandy (35%); laminated; rest black; coaly partings and intercalations; sporadically calcareous; gradational.
- 981 - 986 Sandstone: light medium grey; very fine grained; alternating sands, silts and occasional muds; gradational intervals; slumping; laminated (ripple and wavy); strongly calcareous, BCA 60°; gradational.
- 986 - 1000.5 Mudstone: dark grey; carbonaceous becoming coaly at 989 to 992 (dirty); and 997 to 998.5 (45% recovery); gradational below; silt band at 999 (.5').
- 1000.5 - 1026 Sandstones: light to dark grey; very fine grained; irregular alternating bands (broad) of very fine sand, silts into muds; small scale parallel, ripple lamination; isolated burrows to bioturbated zones; clean areas; with sharp muddy contacts; variable current activity; intraformational erosion; numerous slump structures; carbonaceous laminae; silts 30%; strongly calcareous; BCA 60°; gradational.
- 1026 - 1029 Mudstones: silty; dark grey; top 1.5' regular silt intervals; calcareous; gradational.
- 1029 - 1032 Coal/Carbonaceous Mudstone: Recovery 80%.
- 1032 - 1037 Siltstone: medium grey; finely laminated with argillaceous intervals; sandy layers; coaly streak in middle; strongly calcareous; erosional.
- 1037 - 1038 Sandstone: light grey; fine grained; laminated; clean; strongly calcareous; gradational.
- 1038 - 1040 Mudstones: black; carbonaceous; silty; calcareous; gradational below.
- 1040 - 1046 Carbonaceous Mudstone/Coal: Recovery 90%; slickensides; polished surfaces.
- 1046 - 1046.5 Mud seam.
- 1046.5 - 1050 Bone Coal/Mudstone.

- 1050 - 1052.5 Sandstone: fine grained; medium grey; carbonaceous particles and stringers; slumping disrupting laminae; lower half clean and rippled; middle 0.5' argillaceous; strongly calcareous; abrupt below.
- 1052.5 - 1055 Mudstones: dark grey; carbonaceous; silty; coal streaks; top 1.0' sand; strongly calcareous; ¼" coal at bottom; gradational.
- 1055 - 1058.5 Coal/Carbonaceous Mudstone: initial 2/3 durain; rest shaly coal: recovery 60%.
- 1058.5 - 1061 Siltstone: medium grey; muddy; partly laminated and obliterated by burrowing; lower half argillaceous.
- 1062 - 1062 Sandstone: light grey; very fine grained; interlayers with silt layers; cross lamination; erosional tops on cross-set beds; banded appearance; burrows; strongly calcareous; gradational.
- 1062 - 1063 Mudstone: medium to dark grey; very silty; (homogeneously); strongly calcareous; erosional.
- 1063 - 1064.5 Sandstone: initial 0.8' clean and light coloured sands; well cross laminated and clean; rest very fine sands to silty richly argillaceous with lenses of lighter sands; strongly calcareous; gradational.
- 1064.5 - 1067.5 Mudstone: medium/dark grey; very silty and vaguely laminated in middle; strongly calcareous; gradational.
- 1067.5 - 1068.8 Mudstone: black; richly carbonaceous and with coaly layers; gradational.
- 1068.8 - 1070.5 Sandstones: medium/dark grey; very fine grained; upper half closely laminated and has banded appearance; local interlayering burrowing; strongly calcareous; very gradational; BCA 65°.
- 1070.5 - 1072 Mudstone: black; carbonaceous and coaly layers; very transitional.
- 1072 - 1076 Sandstone/Siltstone: medium grey; upper half very fine sands with numerous micro-erosional contacts with silts, much modification by burrowers, rest richly argillaceous silts; strongly calcareous; gradational.

- 1076 - 1082.5 Mudstone/Siltstone: upper half black and homogenously carbonaceous; rest muddy siltstones, poorly laminated; strongly calcareous; rest non calcareous; bottom 0.3' abundantly traversed by veins; polished contact.
- 1082.5 - 1087 Coal/Mudstone: broken up; recovery 45%; lower half muddy; gradational.
- 1087 - 1105 Sandstone/Siltstone: alternating 1.0' bands; very fine grained sand; burrows in sand; dominance of silts; bottom 1.5' black muds; gradational; strongly calcareous; BCA 60°.
- 1105 - 1108 Carbonaceous Mudstone/Coal: Recovery 70%; gradational.
- 1108 - 1121.5 Mudstone: dark grey to black; top 5' homogenously carbonaceous; vaguely banded and silty below; calcareous where silty; gradational.
- 1121.5 - 1127 Siltstones and very fine Sandstone: medium grey; argillaceous; wavy lamination; sporadic burrowing; carbonaceous streaks; strongly calcareous; gradational.
- 1127 - 1136.5 Coal/Carbonaceous Mudstone: top 3' dirty coal; then 2.5' mudstone silty; then 1' cross laminated sandstone; rest coaly mudstone; non calcareous.
- 1136.5 - 1167 Siltstones: dark grey; argillaceous; structureless; carbonized plant matter; some slumps; increasing carbon bottomwards; non calcareous; transitional; BCA 55°.
- 1167 - 1182 Coaly Zone: recovery 95%; durain.
- 1182 - 1188 Mudstone: carbonaceous; non calcareous; black.

T. D.

DH 75 - 9

0 - 88	Triconed.
88 - 106	Boulders, till, shattered and broken up materials; not in situ.
106 - 112	Sandstone; medium grey, very fine grained, carbonaceous layers; silt layers; laminated and cross laminated; strong calcareous. BCA 80°.
112 - 113.5	Mudstone/Shale; carbonaceous, silty; calcareous.
113.5 - 117	Siltstone; medium grey; calcareous; laminated.
117 - 119	Mudstone/Coaly; broken up.
119 - 123	Mudstone; medium grey; structureless; weathered; gradational below.
123 - 135	Sandstone; medium grey; fine grained, argillaceous; silts and muds interbedded; non-calcareous; abrupt.
135 - 137	<u>COAL</u>
137 - 146	Siltstone/Mudstones; medium grey; calcareous; silty 140 - 142'.
146 - 148.5	Mudstones; medium grey; silty; sandstone(very fine grained) 139 - 139.5; carbonaceous; non-calcareous; BCA 65°.
148.5 - 151	Mudstones; dark grey; homogenously silty; rusty; calcareous; bottom contact not clear.
151 - 154.5	Sandstone; medium grey; very fine grained; small scale cross lamination; wavy lamination; silt intraclasts; strong calcareous.
154.5 - 156	Mudstone; dark grey; slightly silty and carbonaceous; calcareous, gradational.
156 - 163.5	Sandstone; light to medium grey; fine to very fine grained; carbonaceous matter; laminated locally; silty layers with micro-erosional contacts; strongly calcareous except upper 1.0'; abrupt below.

- 163.5 - 172 Siltstone/Mudstone; medium to dark grey, upper 2.0' silty; then 2.0' carbonaceous mudstone; then silty; upper calcareous; bottom non-calcareous; rusty nodules; gradational below.
- 172 - 176.5 Sandstone; light grey, fine to very fine grained; laminated; cross laminated; silty layers; 0.5' mudstone strong calcareous; BCA 750; gradational.
- 176.5 - 190 Mudstone; medium grey; silty; strong calcareous; gradational.
- 190 - 197 Sandstone; light to medium grey; fine to medium grained; initial 1.0' argillaceous and very fine grained; slump lamination; calcareous, abrupt.
- 197 - 204 Mudstones; black; carbonaceous; coaly upper 1.5'; carbonaceous also 202'; calcareous bottom 2.0'.
- 204 - 206 Sandstone; medium grey; very fine grained; argillaceous; laminated, burrows; gradational.
- 206 - 213 Mudstones; black; silty (30% in lower 2.0'); carbonaceous and non calcareous in middle; rest strong calcareous.
- 213 - 222 Sandstones; medium grey; very fine grained; silty layers; cross laminated locally light and dark; strong calcareous; silts grade into sands; muds erosional; gradational below. BCA = 750.
- 222 - 227 Siltstone; medium grey; argillaceous; structureless; non calcareous.
- 227 - 231 Mudstones; black; carbonaceous; coaly, sandy at 229 to 230; gradational below.
- 231 - 237 Mudstone; medium grey; local coal lenses; calcareous.
- 237 - 241 Mudstone; dark grey, carbonaceous; coaly layers.
- 241 - 258 Sandstone alternating with siltstone; medium and dark grey; dominance of silts; cross laminated, burrowing, lower 5' bioturbated; few silt clasts; sands very fine grained; gradational.

258 - 275	Mudstones; silty; medium grey and homogenous looking; strong calcareous; bottom 2' black, carbonaceous, gradational.
275 - 280	Sandstone/Siltstones/Mudstones; upper half very fine grained sand; lower muddy silt; non calcareous; gradational.
280 - 287	<u>COAL</u> - Recovery 50%; not sampled, poor recovery - mainly durain.
287 - 293.5	Mudstones; black; carbonaceous; non calcareous; transitional.
293.5 - 322	Sandstone; light medium grey; fine to very fine grained; alternating sands, silts (inches); very distinctive units; cross laminated; micro-erosional contacts; burrows; ripple cross lamination; BCA 80 ⁰ ; strong calcareous; abrupt below.
322 - 337	COAL - Recovery 75%; clarodurain, bottom 1.0' sandy - not included in sample.
337 - 340	Mudstone; black, coaly; non-calcareous; gradational.
340 - 345	Mudstone; medium grey; silty especially lower half (25%); calcareous especially lower half; gradational.
345 - 353	Siltstones; medium grey; irregularly laminated; very fine sandy bands; very gradational; strong calcareous.
353 - 359	Sandstones; medium grey; very fine grained; chaotic lamination; muddy layers (20%), strong calcareous; gradational; BCA = 80 ⁰ .
359 - 372	Mudstones; medium grey; initial half silty (40%); irregular lamination; strong calcareous save 368 to 372; gradational.
372 - 373	Mudstone; carbonaceous.
373 - 376.5	<u>COAL.</u> - clean; clarain; clarodurain. Recovery 70% (not sampled)
376.5 - 379.5	Mudstone (carbonaceous)/COAL.

379.5 - 381	Sandstone; medium grey; very fine grained, laminated; argillaceous bands; strong calcareous.
381 - 386	Mudstones; black; coaly middle; rest carbonaceous; gradational; middle silty and calcareous.
386 - 392	Sandstones; medium grey; very fine grained; silty intervals; vague lamination; bone coal (.3') at 389; strong calcareous, gradational.
392 - 397	Mudstones; black, coaly; carbonaceous; <u>no</u> silts; non-calcareous; gradational.
397 - 400	Sandstones; medium grey; very fine grained, argillaceous; silt intervals with no erosional contacts; bioturbation in sand layers; BCA = 80°; strong calcareous; gradational.
400 - 407	Siltstones; muddy; strong calcareous; transitional.
407 - 411	Mudstones; medium to dark grey; carbonaceous; sandy bottom; lower non-calcareous; gradational.
411 - 412	Sandstone; argillaceous; banded; wavy bands; carbonaceous matrix; patchy calcareous; gradational.
412 - 414	<u>COAL</u> - upper half bone, lower half durain.
414 - 418	Mudstones; silty; medium grey; middle .6' coal; calcareous; gradational.
418 - 419.5	Sandstones; light grey, fine grained, laminated; argillaceous bands; calcareous; erosional below.
419.5 - 421	Mudstone/COAL; lower half ground out, clean coal.
421 - 473	Sandstones; light to medium grey; BCA 80°; fine to very fine grained; grading into silt layers and silt intercalations; silt/sand boundaries usually erosional; 20% silts; banded; 458' to 467' muddy and .5' coal at 460.5'; fracture with calcite at 468.3'; ripple lamination; slump lamination?; strongly calcareous; very gradational.

- 473 - 478.5 Mudstones; black; upper 2.5' has been arbitrarily cut off to emphasize transitional nature of above unit; laminated; lower 1.5' non-calcareous; gradational.
- 478.5 - 480.5 Sandstones; medium grey; bands of sands and silt; BCA = 75°; calcareous; interbedded below.
- 480.5 - 483 Mudstones and sandstones; middle 1.0' mudstones; rest muddy sandstone; lower 1.0' rippled; argillaceous; calcareous except where mudstone; gradational.
- 483 - 486.5 Mudstones; black; slight carbonaceous; calcareous; gradational.
- 486.5 - 492.0 Mudstones/COAL; black, no silt; coal 488 to 489.5; carbonaceous at base 0.5'; gradational.
- 492 - 498 Siltstone/Sandstone/Mudstones; upper 1.5' argillaceous siltstone; laminated then 1.5' very fine sandstone with siltstone banded; quartzitic pebble lower 3.0' silty mudstone with .3' carbonaceous mudstones; laminated; BCA 85°; calcareous lower 1.0'; rest non-calcareous.

T.D.

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DH 75 - 10

0 - 27	Overburden.
27 - 288.5	MOOSEBAR. Shales and mudstones; dominantly medium to dark grey; silty, and layers of silt and very fine grained sandstone; occasional calcite infilling of fractures; essentially structureless except for micro burrows and large burrows (at 128'); glauconitic sandstone bands at 128', 167.5', 170.5' each approximately 3 inches thick; BCA = 70%; moderately calcareous where silty or sandy, otherwise non-calcareous; non-carbonaceous.
KMbr -----	
KGt 288.5 - 288.8	Conglomerate; fine pebbles.
288.8 - 290.0	Mudstone; Moosebar looking with few scattered pebbles throughout.
290.0 - 293.0	Conglomerate; rounded, sub-spherical pebbles in groundmass and grey, silty fine grained sandstone.
293.0 - 298.0	Mudstone; dark grey; carbonaceous, upper 1.5' siltstone incorporating detrital coal and pyrite; gradational.
298.0 - 298.3	<u>COAL</u>
298.3 - 305.0	Mudstone/siltstone; 70/30; medium grey; lower half siltstone; laminated, calcareous where silty; BCA = 60%; gradational.
305 - 308	Bone Coal and Mudstones; dark grey; carbonaceous matter throughout; gradational.
308 - 316	Siltstone/Mudstone; some very fine sand layers; medium grey; calcareous where silty and sandy; gradational.
316 - 318	Mudstone; silty; medium grey; strong calcareous; gradational.
318 - 319.5	Bone Coal; gradational.
319.5 - 324	Mudstone; black; coaly and carbonaceous especially lower 2/3; gradational.

- 324 - 344 Mudstone; medium to dark grey; irregular silty intercalations (20%); silts brownish-grey; highly calcareous; laminated; BCA = 750; gradational.
- 344 - 354.5 Siltstone/Sandstone with intervals of mudstones; medium grey; sand very fine grained and laminated; argillaceous layers in silt and sand; broad alternating bands; rootlet-like structures; strongly calcareous; gradational.
- 354.5 - 364 Mudstone; black; carbonaceous; silty; no laminations; calcareous; gradational.
- 364 - 370 Sandstones/Mudstones; initial half muddy with silty layers; lower half very fine argillaceous sands; carbonaceous matter; vaguely laminated; calcareous; gradational.
- 370 - 372 Mudstones; silty; medium grey; calcareous; gradational.
- 372 - 376 Bone coal; some carbonaceous mudstone; gradational.
- 376 - 378.2 Mudstone; black; coaly; gradational.
- 378.2 - 280.5 COAL/Carbonaceous mudstone; initial 0.8' vitrinite; rest alternating bands coal and muds; gradational.
- 380.5 - 387.5 Bone coal/carbonaceous mudstone; black, gradational.
- 387.5 - 394.0 Mudstones; dark grey; slight silty; calcareous except where coaly; gradational.
- 394.0 - 397.0 Bone Coal; gradational below.
- 397.0 - 408 Mudstones; black; carbonaceous; silty 405.5 to 407; calcareous where silty; gradational.
- 408 - 421 Sandstone/Siltstone; medium grey, very fine grained, argillaceous; laminated; burrows; lower 4' carbonaceous; calcareous; gradational; BCA = 650.
- 421 - 426.5 Mudstones; dark grey; bone coal at top; rusty band in middle; calcareous; gradational.

426.5 - 429.3	<p>Bone Coal/<u>COAL</u></p> <p>.3' bone coal</p> <p>.3' coaly sandy bentonite</p> <p>1.0' coal - durain</p> <p><u>.5' sandy bentonite</u></p> <p>Rest is coal - durain.</p>
429.5 - 453.0	Mudstones: medium to dark grey; silty in places; rusty bands; coal streaks; calcareous patches; gradational.
453.0 - 461.5	Sandstone/Mudstones: medium grey; middle 3.0' sandy mudstone; rest very fine sands, thin shaly layers throughout; cross laminated; sporadic burrowing; micro-erosional contacts; lower ½' fine grained with carbonaceous matter to bedding; strongly calcareous; BCA 65°; interbedding below.
461.5 - 480	Mudstone: medium grey to dark grey; silty; very obscurely laminated; strongly calcareous; gradational.
480 - 485	Sandstone: medium grey; very fine grained; discontinuous muddy layers (laterally discontinuous) as if having been ripped up in situ; some slumping; cross laminated; sporadic burrows; calcareous; passage below by interbedding. BCA 65 - 70°.
485 - 509.2	Mudstone/Siltstones: medium grey; slightly laminated; strongly calcareous; very gradational.
509.2 - 510.5	Mudstone/Bone <u>COAL</u> : some silt intervals; genetically similar to following seam.
510.5 - 523	<p><u>COAL</u> BCA = 75 - 80°</p> <p>Recovery 55% (7')</p> <p>1.0' clarodurain</p> <p>0.5' durain</p> <p>0.4' sandstone, very fine grained (not included in sample)</p> <p>0.9' durain and vitrain</p> <p>0.2' durain</p> <p>0.5' clarodurain</p> <p>2.5' duraine & (carbonaceous mudstone - not included in sample)</p> <p>1.0' durain</p>

523 - 525 Sandstones: dark grey; slightly carbonaceous;
 silty bottomwards; gradational.

525 - 534.5 Sandstones: medium grey; fine grained;
 interlayers with argillaceous material;
 laminated; few burrows upper 3.0'; calcareous;
 abrupt below.

534.5 -549.5 COAL - Recovery 85% (12.5')
 BCA = 85°

 1.0' clarain and vitrain
 0.5' clarodurain
 2.0' durain
 1.8' clarain
 0.4' clarodurain and vitrain
 6.0' clarodurain
 0.1' siltstone (not in sample)
 0.7' durain

549.5 - 555 Mudstone: dark grey to black; locally
 coaly; gradational.

555 - 558 Mudstones: dark grey; silty; non calcareous.

T. D.